

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
TORONTO,

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TORONTO,

THE BRITISH ENGRAVERS COMPANY

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THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

ANNUAL MEETINGS OF MEMBERS.

1863, NEWCASTLE. 1864, BATH. 1865, BIRMINGHAM. 1866, NOTTINGHAM. 1867, DUNDEE. 1868, NORWICH. 1869, EXETER. 1870, LIVERPOOL.
1871, EDINBURGH. 1872, BRIGHTON. 1873, BRADFORD. 1874, LONDON. 1875, BRISTOL. 1876, GLASGOW. 1877, PLYMOUTH.

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The Conference annually presents to members a handsome octavo volume of 500 or 600 pages, containing the proceedings at the yearly meeting, and a report on the progress of pharmacy, or Year-Book, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulae, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the desk companion of the year, and an invaluable permanent work of reference for chemists and druggists and others interested in pharmacy. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, assistants, or pupils—and obtain as large a number of new members as possible. Alphabetical lists of (1) the names and addresses of subscribers, and (2) of the towns in which they reside, will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to either of the officers or members. No special form of nomination is required. The Name and Address of each candidate to be written legibly, and forwarded to the Hon. Secretary, Professor ATTFIELD, 17, Bloomsbury Square, London, W.C., who will sign the paper, if a member's name is not already appended. The subscription may be sent at the same time.

THE ANNUAL SUBSCRIPTION.

The Annual Subscription is Seven Shillings and Sixpence, payable in advance. For this sum each member is entitled to one copy of the Year-Book, carriage free; and to attend the Annual Meetings.

(Members residing abroad can be supplied with the Year-Book by pre-paying the annual subscription, and the postage to the respective countries, of a book weighing two imperial pounds. The subscription, including postage, for either Australia, Belgium, Canada, Cape of Good Hope, China, France, Germany, Gibraltar, Holland, Natal, New Zealand, United States of America, or the West Indies, is Ten Shillings.)

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COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1878, TO JUNE 30,

1879.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
CONFERENCE

AT THE

SIXTEENTH ANNUAL MEETING

HELD IN

SHEFFIELD,

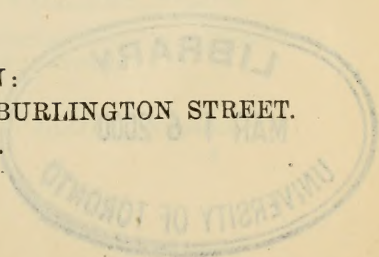
AUGUST, 1879.

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YEAR-BOOK OF PHARMACY, 1879.

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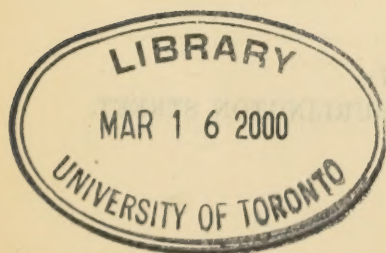
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1879

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THE BRITISH PHARMACEUTICAL CONFERENCE.

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THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1880 will be held at Swansea.

Gentlemen desiring to join the Conference, can be nominated at any time on applying to either of the secretaries or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from the Secretaries—

PROFESSOR ATTFIELD, 17, Bloomsbury Square, London, W.C.

F. BADEN BENDER, F.C.S., 7, Exchange Street, Manchester.

THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary funds for accomplishing this object consist solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 313.

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INTRODUCTION.

ANOTHER year has passed, and once more it becomes our pleasing duty to place before the members of the Conference an account of the progress of pharmacy, so far as this is represented by the yearly contributions to scientific literature. As in previous years,

ERRATA.

Page 103, line 16, for 115 read 125.

.. 114, .. 6, for nitrates read nitrites.

.. 137, .. 14, for Merch read Merck.

acid to 100. Dr. Wright has proposed to call *japaconitine*. When treated with alcoholic solution of potash, it splits up into benzoic acid and *japaconine*, a new base agreeing in its physical properties with aconine, but differing from it in the same features which distinguish *japaconitine* from *aconitine*. Dr. Wright considers it as not unlikely that *japaconitine* does not pre-exist as such in the root, but that it is a hydrated derivative of a parent base of the formula $C_{33}H_{47}NO_{12}$, from which it is formed by the elimination of the elements of three molecules of water from two molecules of the latter; but this parent base he has not succeeded in isolating. He appears now to have but little doubt as to the identity of *japaconitine* with the base extracted from Japanese aconite roots by Messrs. Paul and Kingzett in 1877 (see *Year-Book of Pharmacy*, 1877, p. 469), with whom he also agrees in the observation that these

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INTRODUCTION.

ANOTHER year has passed, and once more it becomes our pleasing duty to place before the members of the Conference an account of the progress of pharmacy, so far as this is represented by the yearly contributions to scientific literature. As in previous years, we again devote the introductory chapter to a brief summary of the contents of the entire volume, or rather of such of its contents as appear to us to have the greatest claim to the notice of our readers. Referring, in the first place, to the work done in connection with the vegetable alkaloids and other proximate principles, we are glad to observe that so important and so difficult a subject as the chemistry of aconite continues to receive the attention of Dr. C. R. A. Wright, and has again been further advanced by the results of his recent researches communicated to the Sheffield meeting of the Conference. In this report he deals chiefly with Japanese aconite root, from which he has obtained a crystallizable alkaloid of the formula $C_{66}H_{88}N_2O_{21}$, which, both from a physical and physiological point of view, closely resembles aconitine, but differs from this, as well as from pseudaconitine, by its composition, its reaction with benzoic anhydride, and its failure to yield apoderivatives on prolonged heating with strong solution of tartaric acid to $100^{\circ}C$. This base he proposes to call *japaconitine*. When treated with alcoholic solution of potash, it splits up into benzoic acid and *japaconine*, a new base agreeing in its physical properties with aconine, but differing from it in the same features which distinguish japaconitine from aconitine. Dr. Wright considers it as not unlikely that japaconitine does not pre-exist as such in the root, but that it is a hydrated derivative of a parent base of the formula $C_{33}H_{47}NO_{12}$, from which it is formed by the elimination of the elements of three molecules of water from two molecules of the latter; but this parent base he has not succeeded in isolating. He appears now to have but little doubt as to the identity of japaconitine with the base extracted from Japanese aconite roots by Messrs. Paul and Kingzett in 1877 (see *Year-Book of Pharmacy*, 1877, p. 469), with whom he also agrees in the observation that these

roots are considerably richer in alkaloid than any other kind of aconite. Like the roots of *Aconitum Napellus* and *Aconitum ferox*, Japanese aconite also yields an amorphous alkaloid, containing a higher percentage of carbon than the crystallizable base, but furnishing nearly the same amount of benzoic acid on saponification. A very important point in Dr. Wright's report is the observation that a practically complete extraction of the alkaloids from aconite root can be effected by alcohol without the addition of any acid; and that by the omission of the latter the troublesome liability of these bases to undergo changes during the process of extraction may be greatly diminished. From atis root (*Aconitum heterophyllum*) the same author has obtained an alkaloid closely corresponding in its properties to Broughton's atisine; but the quantity of material operated upon was too small to lead to satisfactory conclusions, as to whether the body under examination was a definite base, or a mixture. The alkaloids contained in the flowers, leaves, and stalks of English grown *Aconitum Napellus* are still under investigation.

In an elaborate report on the principles of ergot, Mr. T. Blumberg establishes the identity of ecboline and ergotine, and shows among other points of interest that the removal from ergot of the fatty oil by percolation with ether, which is the first step in the preparation of the officinal extract, is always accompanied by the loss of a portion of the active principle. Tanret's ergotinine he regards as probably identical with his (Blumberg's) picrosclerotine, which was mentioned for the first time in the *Pharmaceutische Zeitschrift für Russland*, October 15th, 1877; but on this point he is contradicted by M. Tanret, who claims priority in the discovery of ergotinine, and points out that he has succeeded in preparing this alkaloid in a pure crystallized state, enabling him to undertake its ultimate analysis, whereas Mr. Blumberg has not been able to ascertain the composition of his picrosclerotine. An important investigation by Mr. Stoddart deals with the growth and development of ergot in its various stages, showing that this fungus attains its greatest medicinal activity at the end of its vegetative period, when it has reached the sclerotium stage, but loses in power with the commencement of the fructifying period; and that, for these reasons, ergot ought to be gathered in the months of August or September. It is needless to enlarge on the practical value of these results.

The alkaloids of opium have received another addition to their number by the isolation of a new base, which Messrs. T. & H. Smith, its discoverers, have termed *gnoscopine*. This principle is quite in-

soluble in boiling water and in alkalies, and furnishes readily crystallizable salts having an acid reaction. Its composition is represented by the formula $C_{34}H_{36}N_2O_{11}$. With sulphuric acid it forms a pale yellow solution, changing to carmine-red on the addition of a trace of nitric acid. The pink coloration obtained by Calmberg on moistening codeine with sulphuric acid (see *Year-Book of Pharmacy*, 1875, p. 109) is attributed to the presence of impurities by Dr. O. Hesse, who again asserts that this alkaloid forms a colourless solution with the acid alone, but a blue one with sulphuric acid containing a little ferric chloride. Owing to the very slow action of the acid on the crystalline alkaloid, he now recommends the employment of codeine previously dried in a desiccator and finely pulverized. The assay of opium is dealt with in two reports, one by M. Petit, the other by Professor Flückiger, in both of which cold water is recommended as the most suitable menstruum for extracting the morphine. Professor Selmi, who has given much attention to the detection of morphine in poisoning cases, finds that, while this alkaloid can be detected with certainty in the recent viscera, it no longer exists in an undecomposed condition in the viscera after putrefaction, and that the detection in these of a derivative of morphine ought not to be considered satisfactory proof of the presence of the base.

Pelletierine, the alkaloid recently isolated by M. Tanret from pomegranate bark (see *Year-Book of Pharmacy*, 1878, p. 43), is now proved to be also the tænicidal principle of that drug. It is a colourless, volatile, strongly basic, dextrogyre liquid, the composition of which answers to the formula $C_8H_{13}NO$. Another volatile alkaloid, known as mercurialine, and contained in *Mercurialis annua* and *M. perennis*, is shown by Dr. E. Schmidt to be identical with methylamine, and to be accompanied in those plants by a small proportion of trimethylamine. A still more interesting case of identity between two alkaloids from different sources is reported by M. Petit, who finds that piturine, the liquid volatile alkaloid of pituri (*Duboisia Hopwoodii*), so closely agrees with nicotine in its rotatory power, its alkalimetric strength, the composition and properties of its chloroplatinate, its reaction with iodine, and other features, as to leave no doubt on his mind respecting the identity of the two bases. It will be remembered that piturine was discovered last year by Mr. Gerrard (*Year-Book of Pharmacy*, 1878, p. 594), whose experiments, however, had to be conducted with so small a supply of material as to preclude the possibility of anything like a close study of the properties of his new base. The results of

physiological experiments recently made with Mr. Gerrard's alkaloid, by Drs. Ringer and Murrell, correspond so nearly with those described by M. Claude Bernard in his memoir on nicotine, as to lend much support to M. Petit's conclusion.

Messrs. Wright and Luff's report on the alkaloids of *sabadilla* (see *Year-Book of Pharmacy*, 1878, p. 168) has been promptly followed by the publication of their researches on *Veratrum album* and *Veratrum viride*. Both are shown to contain at least five alkaloids, viz., jervine, $C_{26}H_{37}NO_3$; pseudo-jervine, $C_{29}H_{43}NO_7$; rubijervine, $C_{26}H_{43}NO_2$; veratralbine, $C_{28}H_{43}NO_5$; and veratrine, $C_{37}H_{53}NO_{11}$, the relative proportions and characters of which will be found on p. 129 of this volume. Of these the three first named are well defined crystallizable, non-sternutatory bases; the fourth is amorphous and non-sternutatory; whilst the fifth is amorphous and highly sternutatory. Cevadine, $C_{32}H_{49}NO_9$, occurs in considerable proportion in *V. viride*, but is apparently absent in *V. album*.

The cinchona alkaloids have again absorbed a fair share of attention. Dr. O. Hesse recommends a test for the purity of quinine sulphate, the main features of which are the following:—0.5 gram of the sample is dissolved in 10 c.c. of hot water, the solution allowed to cool, and filtered; 5 c.c. of the filtrate are then shaken in a suitable test tube with 1 c.c. of ether and 5 drops of solution of ammonia, after which the tube is allowed to stand at rest for two hours. The conclusion as to the purity or impurity of the sample is drawn from the separation or non-separation of crystals in the ethereal layer, while the appearance of any such crystals, and the manner in which they form, afford indications of the nature of the impurity. The testing of quinine hydrochlorate is done in the same manner, with this distinction, however, that 0.25 gram of crystallized sodium sulphate is used along with the 0.5 gram of quinine salt at the outset. It will be observed that this test is an elaboration of the one proposed by Dr. Paul two years ago (see *Year-Book of Pharmacy*, 1877, p. 32), both being based on exactly the same principle. Dr. Hesse also describes two tests for the purity of quinidine sulphate, one of which is a modification of the process suggested by Dr. de Vrij, in 1878. The same author also gives an account of a product of change obtained from cinchotenine, possessing all the characters of an alkaloid, and differing from cinchotenine in being more easily acted upon by nitric acid. The partial conversion of quinine into quinidine, alleged by M. Guillochin to take place during its passage through the human system, appears to be disproved by a re-investigation of this subject

by M. Personne. The action of alkaline solutions of potassium permanganate on quinine and its allied alkaloids forms the subject of two reports, one by Messrs. S. Hoogewerff and W. A. v. Dorp, the other by Messrs. J. T. Dobbie and W. Ramsay. Both accounts agree in the interesting observation, that the four principal cinchona bases all yield the same acid (tricarbo-pyridenic acid) as one of the products of this oxidation. In a communication on aricine, read at the Sheffield meeting of the Conference, Mr. J. E. Howard states that the specimen of this alkaloid presented by Dr. O. Hesse to the museum of the Pharmaceutical Society, has proved on examination to be perfectly identical with the one he had himself deposited in the museum in 1852, and that both specimens were obtained from the same kind of bark, the *jaune de Cuzco*, of Delondre and Boucharlat, which is probably the only bark from which this alkaloid has been obtained. He agrees with Dr. Hesse as to its non-occurrence in *Cinchona succirubra*. Another report by the same author gives the results of his analysis of a number of cinchona barks from Columbia, showing a variation of 2.72 to 6.24 per cent. in the amount of total alkaloids contained in them, and of 0.00 to 3.25 in the percentage of quinine. M. Prunier publishes the details of a new process for assaying cinchona barks, consisting mainly in the exhaustion of an intimate mixture of the powdered bark and slaked lime by means of chloroform, the evaporation of the latter, the solution of the residue in dilute hydrochloric acid, the precipitation of the total alkaloids by ammonia, and the separation of quinine from the precipitate by ether. An acid and a neutral sulphovinate of quinine, both exceedingly soluble salts, are described, together with their mode of preparation, by M. Carles. Some of the commercial salts of quinine are far from what they are represented to be, as may be gathered from Mr. J. Jobst's analyses of seven samples of so-called tannate of quinine, Dr. Biel's examination of commercial quinine carbolate, and Mr. O. Adler's analysis of trade specimens of arsenite of quinine. The tannates exhibit a variation from 4.46 to 31.37 in their percentages of quinine; the carbolate is found to be wholly or partly composed of sulphocarbolate; while the arsenite proves to be a mere mixture of quinine and arsenious anhydride. A formula for the preparation of pure quinine arsenite, recommended by Mr. Adler, will be found on page 27 of this volume.

A few more observations will conclude our notices of alkaloids and similar principles in this place. Professor Prescott points out that the usual process of purifying strychnine is an unsatisfactory

and wasteful one, and recommends as a decided improvement the use of a much weaker spirit than is usually employed. He finds spirit of .970 specific gravity to answer best for the purpose, as it removes the whole of the brucine without dissolving more than a trace of strychnine. Pilocarpine, the alkaloid of jaborandi, is shown by Mr. Gerrard to be best extracted by ammoniated alcohol, the yield in this case being larger and the separation and purification of the alkaloid less troublesome than with the application of plain alcohol, acidulated alcohol, or water. A re-examination of solanine, solanidine, and their acetyl derivatives by Mr. A. Hilger, leads to corrections in the formulæ of these bases, and exhibits such discrepancies between the proportion of glucose obtained by him and that obtained by Messrs. Zwenger and Hind in the conversion of solanine into solanidine, as to render a further study of this reaction desirable. *Daphnetin*, a crystallizable decomposition product of the glucoside daphnin (from mezereon bark) is described by Mr. C. Duenkel. The conversion of salicin into saligenin and glucose by boiling with acidulated water, a reaction usually commended for the detection of salicin, is proved by Dr. A. Senier to be untrustworthy as a test, owing to the rapid conversion of the newly-formed saligenin into saliretin, and the failure of the latter to produce the blue coloration with ferric chloride. The formation of saligenin from salicin by fermentation with synaptase, as recommended by Piria, is, in Dr. Senier's opinion, too slow a process to render it practicable for analytical purposes.

The chemistry, pharmacy, and therapeutics of chrysophanic acid form the subject of an elaborate report by Dr. J. L. Macmillan, a copious extract of which in this volume will supply the reader with much information respecting a body which, during the last few years, has been a prominent item in medical literature. Messrs. Liebermann and Seidler confirm Professor Attfield's statement relative to the large yield of this acid from Goa powder, but show that it does not pre-exist in this drug, but is formed by oxidation from a crystallizable constituent of the formula $C_{30}H_{26}O_7$, which they propose to call *chrysarobin*. The conversion of the latter into chrysophanic acid is explained by the following equation:—



So readily does this change occur that chrysophanic acid, though not an actual constituent of Goa, is still likely to be the cause of its therapeutic action. Salicylic acid is said to possess anthelmintic, or rather teneicidal properties in addition to the numerous other

virtues for which it has already become famous. The assertion, repeatedly made, that the prolonged administration of moderate and even small doses of this acid is injurious to health, is contradicted by Professor Kolbe, who has experienced none but beneficial results from the daily consumption of one gram continued for twelve months. Chlorate of potassium, on the other hand, which is generally regarded as perfectly harmless, is found to be capable of producing toxic and even fatal effects, if taken in quantities of 4 to 5 drams per day, or in single doses of one ounce and upwards. The salts of salicylic acid described in this volume are those of atropine, copper, and zinc. Copaivic acid has recently engaged the attention of several investigators, and various formulæ are recommended by them for the preparation of this substance. The opinion seems to be gaining ground that it is to this constituent chiefly, and not to the essential oil and amorphous resins, that the medicinal action of copaiba must be attributed. Drs. Zlamál and Roquette find that the acid resin, during its passage through the organism, forms combinations with the alkalies, and that the presence in the urine of the salts thus formed is the main cause of the healing action of copaiba in gonorrhœa and similar affections. Direct experiments made by them with sodium copaivate appear to confirm this view and to establish the value of this salt as a remedial agent.

Mr. Thresh gives a detailed description of a new process for the detection of minute quantities of alcohol, the main features of which consist in the conversion of the alcohol into aldehyde by distillation with potassium bichromate and dilute sulphuric acid, and the recognition of the aldehyde in the distillate by the characteristic yellow coloration produced on heating with caustic soda. By comparing the depth of coloration with that produced in the same manner with aldehyde solution of known strength, it is possible to obtain a fairly accurate estimation of the quantity of the alcohol. The process is a very plausible one, and being applicable for the testing of chloroform and essential oils, and presenting no technical difficulties in its execution, it is sure to be favourably received by pharmacists not less than by the professional analyst. A solution of mercuric nitrate is recommended as a reagent for alcohol by M. Jacquemart, who finds that this salt is partly reduced by the alcohol to the mercurous state, and that ammonia, therefore, produces a blackish precipitate in the mixture after this reducing action has been allowed to proceed for some time. Dr. de Vrij's process for the preparation of ethyl bromide has been objected to

on the ground that it yields a product contaminated with common ether, from which it cannot be freed by fractional distillation. To remedy this defect, modifications are proposed by Dr. W. H. Greene and others, consisting principally in the application of diluted instead of strong ethyl-sulphuric acid for the decomposition of the potassium bromide. With this improvement the process is said to be particularly well suited for operations on a large scale; while for the preparation of smaller quantities of this substance, Mr. J. P. Remington's method (see *Year-Book of Pharmacy*, 1878, p. 115) is spoken of as probably preferable. Mr. H. Werner suggests a new process for the purification of chloroform, and notices the occurrence of amylic alcohol among the impurities in the commercial article. For the detection of methyl in chloroform and ether, Mr. H. W. Langbeck employs a weak solution of silver nitrate, relying for the indication of this impurity on the appearance of reddish violet coloration at the line of contact between the reagent and the liquid under examination. In a paper on "Amylic Alcohol and Amylic Nitrite," read at the recent meeting of the Conference, Mr. D. B. Dott substantiates his previous statements (*Year-Book of Pharmacy*, 1878, p. 500) relative to the boiling point of amylic alcohol from fousel oil, the partial decomposition of amylic nitrite during distillation, and the inconstancy of temperature at which this distillation proceeds, all of which had been called in question by Dr. W. H. Greene in the *American Journal of Pharmacy* of February, 1879. A contribution to the same meeting by Mr. Allen furnishes a valuable summary of characteristic reactions for the distinction of benzol and petroleum spirit, and also shows how the different behaviour of these two substances to fuming nitric acid may be made available for the detection and approximate estimation of petroleum spirit in a mixture of it with benzol.

An experimental comparison of the principal tests for hydrocyanic acid leads Messrs. A. Link and R. Mœckel to the conclusion that the sulphocyanide test is by far the most delicate of all, showing the presence of 1 part of the anhydrous acid in 4,000,000 parts of solution. Next in order of merit comes the reaction with guaiacum and sulphate of copper, by which this acid may be detected in solutions containing 1 part in 3,000,000. Far less delicate than either of these is the Prussian blue test, which fails to indicate less than 1 part per 50,000; while the extreme limit of the reactions with silver nitrate and with iodide of starch is reached with solutions containing H Cy in the proportion of 1 in 250,000. A reverse application of the reaction of cyanides and certain other salts

with copper sulphate and guaiacum is proposed by M. Purgotti as an excellent means for the detection of minute quantities of copper. A critical examination by Professor Bunsen, of some of the methods frequently adopted for the estimation of arsenic and antimony and the separation of these metals from each other, brings to light various defects in these methods, such as are likely to lead to serious errors in the results. At the same time this distinguished chemist does not fail to show how such errors may be avoided, and to replace the unsatisfactory processes of separation by one of greater accuracy, the principal details of which will be found in this volume. Professor Selmi also gives his attention to the detection of arsenic, but confines himself more to the recognition of this poison in toxicological investigations, and particularly to the examination of the arsenical ring obtained in Marsh's Test. The destruction of organic matter by means of potassium chlorate and hydrochloric acid as generally performed in the search for arsenic and other metallic poisons in forensic analyses, is shown by M. van Melckebeke to be always accompanied by the formation of oxalic acid from the starch and cellulose present. This observation appears important, inasmuch as it may prevent oxalic acid found in such investigations from being erroneously regarded as a pre-existing constituent of the substance under examination. The formation of oxalic, formic, and acetic acids under such conditions, moreover, may unexpectedly cause a complete precipitation of any zinc present during the treatment with sulphuretted hydrogen, especially if previous to the introduction of this gas the liquid has been freed from undue excess of acid, as is frequently done, by neutralization with ammonia and re-acidification with a small quantity of hydrochloric acid. This risk of overlooking the presence of zinc in forensic analysis is pointed out by M. Chapuis, who therefore urges the necessity in such cases of searching for this metal in the sulphuretted hydrogen precipitate, unless the latter was formed in the presence of a decided excess of mineral acid. The question, often discussed, whether or not perfectly pure hydrogen affects a solution of silver nitrate, is answered in the affirmative by Mr. E. Schobig, who obtained a distinct reduction of this salt with hydrogen previously freed from every trace of arsenic, antimony, sulphuretted hydrogen, phosphoretted hydrogen, and hydrocarbons. He effects this complete purification by passing the ordinary impure gas first through a solution of potassium permanganate and then through one of sodium hydrate. For the purification of large quantities of hydrogen MM. Varenne and Hebré consider permanganate as too expensive,

and recommend in its place an acidified solution of potassium bichromate, which they find to yield equally good results.

The quantitative determination of precipitates without filtering, washing, and drying them is a subject of no small importance to those engaged in chemical analyses, who will therefore notice with pleasure the able treatment it has received at the hands of Mr. R. Popper. The specific gravity of the liquid in which the precipitate is uniformly suspended, together with the specific gravity of the clear liquid decanted from the precipitate, and that of the precipitate itself, furnish the data from which the actual weight of the precipitate is calculated. The subject is a very large one, and requires numerous further experiments before these methods of analysis are likely to meet with a more general adoption.

The power of glycerin to dissolve certain metallic oxides and hydrates forms the basis of several analytical methods proposed by Mr. E. Donath, including among others a very handy mode of separating copper from cadmium. A considerable amount of attention has been devoted to the study of the reducing action of glucose and lactose on alkaline copper solutions, and to their estimation by means of this reaction. From the various reports on this subject, it appears that the amount of copper oxide which a given weight of grape sugar can dissolve in the presence of alkali, is much smaller than that which it is capable of reducing; that the reducing action of sugars on alkaline copper solutions cannot be expressed by a definite proportion of equivalents, since the quantity of copper oxide reduced varies with the strength of the copper solution; that the results obtained with Fehling's solution by titration are very exact when made under the same conditions as to concentration; and finally, that no reliance can be placed on the accuracy of gravimetric estimation of sugar by means of alkaline copper solution. To judge from Mr. F. Soxhlet's observations, the volumetric determination of sugar of milk by Fehling's solution seems less liable to error through variations in the strength of the sugar solution than that of glucose, as practically the same results were obtained with $1\frac{1}{2}$ per cent. and $\frac{1}{2}$ per cent. solutions of this sugar, the amount of copper required in both cases being 7.4 atomic weights to 1 molecular weight of lactose, a ratio which fairly agrees with that more recently found by Messrs. Rodewald and Tollens. An interesting modification of the usual method of estimating sugar by titration is proposed by Dr. F. W. Pavy, and consists in the application of Fehling's solution mixed with solution of ammonia, and the gradual addition of the diluted saccharine liquid to the boiling mixture

until the blue colour has just disappeared. The process is based on the fact that the cuprous oxide produced by the reducing action of the sugar, instead of being precipitated, is held in solution by the ammonia, and that if access of air be excluded, the resultant liquid is colourless. For the mere detection of glucose, M. Polacci recommends to replace the copper sulphate in Trommer's test by a ferric solution, and to recognise the partial reduction of the latter by the addition of potassium ferrocyanide to the boiled mixture, after previous acidification with dilute sulphuric acid. The analysis of urine has received numerous contributions during the year, embracing reports on the detection therein of sugar, bile pigments, carbolic acid, creatinine, indican, and mercury, the determination of sulphuric acid and of chlorates, and the complete separation of albumen. The statement, repeatedly made, that traces of albumen frequently occur in the urine of perfectly healthy persons receives the fullest confirmation from analyses conducted by Dr. W. Leube for seven consecutive days, with the morning and afternoon urine of a large number of soldiers. This author arrives at the conclusion that there are two forms of physiological albuminuria: one, in which albumen is secreted by healthy persons after bodily fatigue only; and another, in which the secretion of albumen occurs in the absence of such fatigue; but that in all such cases the quantity of albumen found in the urine is very small, and certainly never reaches 0.1 per cent.

A lengthy communication to the Chemical Society from Dr. Tidy, an abstract of which will be found in this volume, has once more brought the subject of water analysis prominently to the front, and has led to another animated discussion relative to the best means of determining objectionable organic impurities in potable waters. Of the various methods employed for this purpose, Dr. Tidy gives decided preference to what he terms the "Oxygen Process," which is a modification, worked out by him, of the ordinary process of titration by potassium permanganate. He rejects the "Ammonia Process" on grounds, the soundness of which will probably be admitted by all who, like himself, have made this method the subject of a critical study. But with regard to his objections to the "Combustion Process" of Drs. Frankland and Armstrong, we look in vain for any experimental evidence in their support; and however forcible these objections may appear from a purely theoretical point of view, it can hardly be denied that Dr. Tidy's practical experience with this process, so far as can be judged from his paper, tends rather to confirm than to weaken the value of its indications.

As regards the analysis of articles of food and the detection of adulteration therein, we can, in this place, only briefly allude to some of the various researches connected with this subject, and recorded in this volume. Mr. A. W. Blyth draws attention to the normal occurrence in milk of two alkaloidal bodies, which he names *galactine* and *lactochrome*, and to the probable presence of a glucoside derived from the cow's food. A comparison of the results of numerous analyses of milk from healthy and diseased cows, leads him to the conclusion that a cow suffering from acute disease may give milk, differing in no essential feature from normal milk, whilst local affections of the udder may often be easily recognised. A rapid process of milk analysis, recommended by Mr. A. Adam, differs from the usual methods principally in the estimation of the fat by a modification of M. Marchand's process, very similar to that suggested by Mr. Allen, at the Bristol meeting of the British Pharmaceutical Conference, in 1875. Messrs. W. Fleischmann and P. Vieth report the results of their experience with Hehner's process of butter analysis, showing that the amount of insoluble acids in genuine butter may vary from 85·7 to 89·7 per cent., and that in the case of samples yielding between 87·5 and 89·7 per cent. of these acids, the process affords no reliable indication either of genuineness or adulteration. Messrs. F. M. and G. Rimmington object to the calculation of the percentage of alum contained in adulterated bread or flour from the aluminium phosphate found in the ash in excess of a certain quantity, basing their objection on the observation that the presence of alumina in much larger proportion than is generally allowed, is quite compatible with perfect freedom from alum. They prefer to extract the alum direct from the flour or bread by maceration with a mixture of spirit and water, and subsequent dialysis. They also report most favourably on the merits of the logwood test as a qualitative process. For the detection of ergot in flour, Dr. E. Hoffmann proposes a modification of a test, previously described by Mr. C. A. Wolff, by which he claims to be able to detect this substance if present to the extent of only $\frac{1}{50}$ per cent. The examination of cocoa forms the subject of several papers, in one of which Professor Wittstein points out that the starch naturally existing in this article does not interfere with the application of iodine for the detection of starch fraudulently added to it; while others, by Mr. G. Wolfram and Professor Dragendorff, deal with the determination and the properties of theobromine. Dr. Campbell Brown publishes the results of analyses of authentic specimens of genuine

honey, together with particulars respecting the method of analysis adopted.

Much attention has recently been given to the study of the action of diastase upon starch. MM. Musculus and Gruber trace this reaction through all its stages, showing it to be more complicated, and to yield a larger number of intermediate products, than had hitherto been supposed. Mr. Maercker also investigates the nature of this reaction, while Mr. Baswitz and Messrs. Dunstan and Dimmock deal with the same reaction from an analytical point of view, in working out processes for the estimation of diastase in malt extracts. For the purpose of this estimation, Mr. Baswitz relies on the amount of sugar found during the action of the diastase on an excess of starch. Messrs. Dunstan and Dimmock, on the other hand, find it preferable to ignore the products of the reaction, and simply to measure the starch-converting power of the extract under examination. From an investigation by MM. Bachet and Savalle, it appears that carbonic acid shares the power of the stronger mineral acids of converting starch into dextrin and glucose, and that the large quantities of this gas given off as a by-product during the fermentation of brewers' or distillers' wort may be advantageously employed for this conversion in the place of malt or mineral acids, especially as the carbonic acid can always be regained and used again for the same purpose.

Dr. E. Schering criticises the principal methods in actual use for the preparation of potassium iodide, and, after carefully considering the strong points and defects of each, comes to the conclusion that the most satisfactory process is the one based on the decomposition of ferroso-ferric iodide by potassium carbonate. He also draws attention to the frequent presence of lead in this salt, an impurity which affects both the colour and the form of the crystals, and which cannot be removed by sulphuretted hydrogen except from very dilute solutions. Mr. A. Riche points out that the same impurity very commonly occurs in commercial samples of bismuth subnitrate, but not to an extent likely to make this preparation a source of lead poisoning. In discussing the relative merits of various processes for the preparation of this salt, he expresses the opinion that the pharmacopœial process yields a purer product than any other, and that it is also the most economical, provided the acid liquor decanted from the precipitate is preserved for the recovery of the bismuth contained in it. M. Lalieu, on the other hand, claims to have obtained a purer preparation by using ammoniated water for the precipitation, and treating the precipitate first with soda

solution, and then with a definite amount of nitric acid, before washing it with water. In connection with this subject it should be remembered, however, that, in the case of this preparation, different processes are almost certain to yield products of different composition, and that for this reason the directions of the national Pharmacopœia ought to be strictly adhered to. In a report on "Aceto-nitrate of Iron as a Medicinal Agent," read before the Pharmaceutical Society, Mr. J. Williams shows that the various salts formed by the combination of peracetate and pernitrate of iron, and described by M. Scheurer-Kestner, all appear to yield the same final product upon repeated recrystallization, and are probably one and the same salt in a more or less impure condition. He regards the difficulty of keeping a solution of this salt suited for dispensing purposes as the principal drawback to its general use as a medicinal agent, in which capacity it might otherwise prove very valuable. A new process for the preparation of mercurous iodide, described by M. Yvon, consists in the precipitation of this body from a solution of mercurous nitrate by potassium iodide in the presence of glycerin, and is based on the power of the latter to prevent the decomposing action of water on mercurous solutions. The direct combination of iodine with metallic mercury is turned to account by Mr. E. Davies for the purpose of estimating the amount of water in iodine. A re-investigation by M. van der Plants of the products of the action of sodium amalgam on alkaline nitrates confirms the existence of hyponitrous acid, HNO , the silver salt of which had been prepared and examined by Mr. E. Divers in 1871. In a further note on hypophosphoric acid, $\text{H}_2\text{P O}_3$, Mr. T. Salzer gives a detailed account of the combinations of this acid with the alkalies and alkaline earths, and recommends a solution of sodium hypophosphate for the volumetric estimation of calcium in neutral solutions. M. Baudrimont publishes a process for the assay of zinc phosphide, which will prove valuable to pharmacists on account of the variable and often very impure condition in which this important medicament is met with in commerce.

Of the essential oils investigated during the past year, none has received so much attention as the oil of *Anthemis nobilis*, no fewer than four papers by different authors dealing with the constituents of this oil and the acids obtained by its saponification. According to these researches, oil of chamomile consists of a mixture of isobutyl isobutyrate, isobutyl angelate, amyl angelate and tiglate, and the angelic and tiglic ethers of a new hexyl-alcohol and of terpene

alcohol (anthemol). The same reports confirm M. Demarçay's observation relative to the conversion of angelic acid into tiglic acid by the action of heat or of concentrated sulphuric acid; while a further investigation of the volatile oils of croton oil, by Dr. E. Schmidt, removes all doubt as to the identity of tiglic with methylcrotonic acid. Dr. Tilden has examined a sample of oil of lemon prepared by distillation in this country, and obtained among the products of fractional distillation about 70 per cent. of a terpene (*citrene*) differing from hesperidene—the corresponding terpene of orange—by its reactions with strong sulphuric acid and with nitric acid and alcohol. From *Origanum hirtum*, M. E. Jahns has obtained a lævo-rotatory oil containing, besides several terpenes, about 50 to 60 per cent. of a phenol of the formula $C_{10}H_{14}O$, identical with carvacrol. The oil of *Thymus Serpyllum* is found by Dr. Buri to contain a phenol resembling thymol, but differing from this in its congealing point, its reaction with ferric chloride, and in the form of the potassium salt of its sulpho-acid. Commercial oil of eucalyptus is said to be a very variable article, owing to its being derived from at least twelve different species, among which *Eucalyptus amygdalinus* is named as its principal source. The oil of *Eucalyptus globulus* appears to possess more therapeutical efficacy than those of other species, and to be the only one used in the preparation of eucalyptol.

Few of the year's contributions to pharmaceutical literature will be read with greater interest than Mr. Thresh's report on the constituents of the rhizome of *Zingiber officinale*, presented to the British Pharmaceutical Conference at its Sheffield meeting. It would be difficult to name another drug of equal importance, the chemistry of which has been so utterly neglected; for with the exception of the volatile oil, not a single constituent of this drug appears ever to have been investigated. In addition to this oil, Mr. Thresh establishes the presence of a crystalline, odourless and tasteless fatty matter of complex nature, a non-crystalline red fat, a neutral resin, two acid resins, and an intensely pungent viscid principle of treacle-like consistence, to which he gives the name of "*gingerol*." All these substances are contained in the ethereal extract; while the residue insoluble in ether is composed chiefly of starch, mucilage, cellulose, metarabin, albuminoids, and mineral matter. Mr. Thresh also makes the interesting observation that fine Jamaica ginger contains less of the pungent principle, and considerably less of volatile oil, than African and Cochin ginger; but that its oil has a finer aroma than that of the others. A new formula for the preparation of soluble essence of

ginger, proposed by Mr. Thresh at the same meeting, is a modification of the one proposed by him last year, the improvement now suggested being based on the results of his chemical investigation.

Another important communication read at the same meeting deals with the chemistry of chaulmoogra oil, and is the work of Mr. John Moss. This East Indian drug, which is the produce of *Gynocardia odorata*, has recently attracted much attention as a valuable remedy in certain skin diseases, and has also been successfully employed in the treatment of pulmonary affections. Among the constituents isolated from this oil by Mr. Moss, the most interesting one is a new fatty acid named by him *gynocardic acid*, which crystallizes in characteristic plates, and has a composition answering to the formula $C_{14}H_{24}O_2$. This acid and palmitic acid exist in it both in the free state and in combination with glyceryl, and are accompanied by glycerides of hypogæic and cocinic acids.

Several other new remedies have been brought under the notice of the medical profession. The root-bark of *Mouninia Polystachia*, a South American plant of the Order *Polygalaceæ*, is spoken of as a valuable astringent, while the leaves of the same plant are recommended as an expectorant. The leaves of *Myrtus Chekan*, a shrub indigenous to the central provinces of Chili, are said to possess tonic, expectorant, diuretic, and antiseptic properties, and to have been used with great success in bronchitis, catarrh of the bladder, and other affections of the mucous membrane. A description of the leaves is given by Mr. Holmes, who also mentions the results of a preliminary chemical examination by Mr. C. H. Hutchinson, showing tannin and an essential oil to be their principal constituents. The root of *Silphium lacinatedum*, a North American drug, is found to produce good effects in chronic bronchitis and asthma, and the herb of *Arenaria rubra*, an Algerian plant, in catarrh of the urinary organs arising from gravel and other causes. *Sanguinaria Canadensis*, applied in the form of a tincture is described as an efficient antidote to *Rhus toxicodendron*. The root of *Berberis aquifolium* is said to unite the therapeutic properties of *Hydrastis Canadensis* with those of *Podophyllum peltatum*, but to be particularly useful in bilious fevers. The berries of the Saw Palmetto (*Sabal serrulata*), a native of South Carolina, Georgia, and Florida, are attracting some attention on account of their sedative, expectorant, and diuretic properties, which renders it an efficient remedy in bronchial affections, and in irritated conditions of mucous membrane generally. Notices of a number of other remedies hitherto unknown to European practitioners will be found in the valuable reports by Mr. Holmes, Dr. Dymock, and Dr.

E. Palmer, dealing respectively with Siberian plants, Indian drugs, and medicinal plants used by North American Indians.

Mr. Holmes calls attention to a case of adulteration of senega with the rhizome and rootlets of *Asclepias vincetoxicum*, and supplies a full description, illustrated by woodcuts, of the distinctive character of the two drugs, which will enable pharmacists readily to detect this fraud, should they meet with a similar case. He also gives the features by which true Calabar beans may be distinguished from the seeds of *Physostigma cylindrospermum*, which have recently occurred among those of *P. venenosum* in the London market. Another paper by the same author establishes the non-identity of guaicura and baycura roots, and shows that while the former is probably derived from *Statice Brasiliensis*, nothing is known at present respecting the botanical source of the latter. Two cases of gross adulteration of kamala are reported by Mr. A. Kremel, in one of which red bole proved to be the chief constituent of the sample, whilst the second specimen was found to consist almost entirely of dried and powdered flowers of *Carthamus tinctorius*. MM. Oberlin and Schlagdenhauffen, enumerate the leading characters by which the bark of *Galipea Cusparia*, may be distinguished from nux vomica bark, Brazilian Angostura bark, guaiacum and copalchi barks, *Cinchona bicolorata*, and the bark of *Samadera Indica*, all of which have been known to occur as substitutes for the genuine drug.

In a report on Bidara Lant, Mr. H. G. Greenish confirms Dr. E. A. van der Burg's observation that this drug contains a considerable proportion of brucine and not even a trace of strychnine, and speaks of it as a valuable source for the preparation of pure brucine. Another paper, by the same author, deals with the action of iodine on rhubarb, proving that, contrary to M. Husson's assertion, this action does not afford a means of determining the relative qualities of different samples of rhubarb. Mr. Greenish also records the results of complete quantitative analysis of various kinds of rhubarb, which will be accepted as a valuable addition to those published last year by Professor Dragendorff. Vera Cruz sarsaparilla is considered by Professor Radius as superior to Honduras, on account of its larger percentage of saponin and resin, on which the efficacy of the root is generally supposed to depend. Mr. H. Collier reports on the chemical condition in which saponin exists in quillaia bark, and also draws attention to the value of a tincture of this bark as an emulsifying agent. Mr. C. Rump announces the interesting observation that vanillin occurs in Siam benzoin, and that it can be

profitably prepared from this source by a comparatively simple process. Japanese cinnamon is found by Dr. G. Martin to contain an essential oil differing materially in its chemical and physical properties from the oils of Ceylon cinnamon and cassia. Malabar kino has yielded to Mr. C. Etti a new crystalline constituent soluble in water and ether, which he proposes to name *Kinoin*. Scoparin and sparteine, the two active principles of *Sarothamnus Scoparius* form the subject of a research by Dr. E. Merck, showing, among other points of interest, that the subcutaneous application of these substances produces a very decided diuretic effect. Dr. O. Hesse describes three alkaloids isolated from Lotur bark (*Symplocos racemosa*), which are distinguished by the names loturine, coloturine, and loturidine. The two alkaloids, ditamine and echitamine, obtained by Messrs. Jobst and Hesse from dita bark in 1878, are regarded as indefinite substances by Mr. E. Harnack, who asserts that this drug contains but one alkaloid, *ditaine*, for which he finds the formula $C_{22}H_{20}N_2O_4$. Mongumo bark has been examined by Professor Dragendorff, whose analysis shows the presence of a large proportion of a peculiar acid principle named by him *mongumic acid*. A recent investigation of podophyllum resin points to the presence therein of an alkaloid, the existence of which, however, requires further confirmation. Alkaloidal bodies have also been isolated from *Baccharis coridifolia*, *Crossopteria febrifuga*, *Aspidosperma Quebracho*, *Sarracenia purpurea*, and *Anthocercis viscosa*; but most of these principles are still under investigation. Among the numerous other vegetable drugs which during the past year have formed objects of research, we may here mention the leaves of *Sparattosperma leucantha*; the barks of *Myroxylon Perniferum*, *Erculea glauca*, *Rhamnus Purshiana*, *Euonymus atropurpureus*, and *Carya tomentosa*; the roots of *Paeonia Moutan*, *Scopalia Japonica*, *Cimicifuga racemosa*, and a false *Pareira brava*; the rhizomes of *Berberis nervosa*, *Smilax glauca*, and *Singunaria*; the bulb of *Erythronium Dens-canis*; the fruit of *Balsamocarpum brevifolium*; the seeds of *Camellia Japonica*, and *Ligustrum Ibotu*; the juice of *Carica Papaya*; the gum of *Quebracho colorado*; the resin and gum of gamboge; and the wax of *Ficus gummiiflua*.

In a report on the analytical examination of tinctures, Mr. Allen deals with the determination of the spirit strength of these preparations, and in one particular instance (that of tinctura camphoræ co.), he also gives directions for the estimation of some of the other constituents. The tendency of tincture of kino to gelatinize on keeping forms the subject of a paper by Mr. T. H. Bamford, in

which frequent agitation of the tincture and exclusion of light are recommended for the prevention of this change. A kinate of quinine is recommended by Mr. H. Collier as a very suitable quinine salt for hypodermic use, owing to its great solubility and the perfect neutrality of its solution. To prevent the loss of quinine invariably resulting from the washing of the precipitated alkaloid in the valuation of *ferri et quinæ citras*, Dr. W. Stevenson suggests that the washing be conducted with weak ammonia water, previously saturated with quinine. With reference to the valuation of this preparation, Mr. F. W. Fletcher points out the importance of testing the precipitated and weighed quinine for cinchonidine and other cinchona alkaloids, as these are not unlikely to occur in it. Dr. Hager draws attention to the imperfect exhaustion of the cinchona bark in the preparation of *vinum cinchonæ*, and to the subsequent separation of a portion of the dissolved alkaloids after the wine has been kept for some time. To obviate this double loss he proposes the use of white wine, acidified with 1 to 1½ per cent. of hydrochloric acid. Mr. M. Conroy confirms Mr. Ekin's observations relative to the value of proof spirit for the exhaustion of cinchona bark, and describes an improved formula for the preparation of the liquid extract, based on the application of this menstruum. The addition of a definite proportion of sugar of milk to the ordinary hard extracts, and the reduction of the mixtures to perfectly dry uniform powders is recommended by Mr. C. S. Hallberg, on the plea that such saccharated extracts are more stable, and much more handy for the purposes of dispensing. Experimental comparisons of samples of *extractum conii*, prepared by different processes, lead MM. Rochefontaine and Mourrut to the conclusion that an alcoholic extract from the seeds—or rather that portion of the alcoholic extract which is soluble in water—is the most active preparation of this kind. A decided improvement in the preparation of *liquor ferri perchloridi* is suggested by Mr. E. B. Shuttleworth, and consists in the gradual addition of the solution of ferrous chloride, acidified with the requisite quantity of hydrochloric acid, to the nitric acid, instead of adding the latter to the former. In this case the complete conversion to the ferric state takes place without frothing and without the application of heat. Improved processes are also published for the preparation of *emplastrum plumbi*, *unguentum diachylon*, *linimentum terebinthinæ aceticum*, *liquor arsenicalis*, cod-liver oil emulsions, and the diluted acids of the British Pharmacopœia, as well as for the testing of Peruvian balsams and several other drugs. Both vaseline and essential oil of bitter almonds are

reported to be very suitable solvents of iodine in all cases in which the substance is intended for topical application. Mr. W. Willmott, in a paper on plasma or glycerin of starch, shows that, by a judicious dilution of the glycerin with water, previous to the introduction of the starch, a preparation may be obtained which will resist the action of moisture, and retain indefinitely its firm and plastic condition. Dr. Hager describes a very handy mode of determining the specific gravities of solid fats and resins, the principal feature of which consists in the application of mixtures of various proportions of alcohol and water, and of glycerin and water, in order to ascertain in which of these mixtures the fat or resin will float. The specific gravity of this mixture then represents that of the substance under examination. Finally, we refer to Dr. Symes's lucid description of the construction and principle of the polarimeter as a valuable contribution to recent pharmaceutical literature, which, we trust, will have the effect of inducing pharmacists to avail themselves more largely of the numerous services of this most useful instrument.

The majority of abstracts in the present *Year-Book* will be found to be more condensed than those in most of the previous volumes. In no case, however, has this abridgment been carried so far as to make the reader unduly dependent on the original articles. A perusal of the general index will show that the requirements of pharmacists have again formed the guiding element in the selection of material for this work.

PHARMACEUTICAL CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

PHARMACEUTICAL CHEMISTRY.

Relative Delicacy of the principal Tests for Hydrocyanic Acid.

A. Link and R. Mœckel. (*Zeitschr. für analyt. Chem.*, 1878, 455.)

1. *The Silver Test*.—The precipitation of silver cyanide by means of solution of silver nitrate indicates the presence of hydrocyanic acid in solutions containing more than 1 part in 250,000, but fails with smaller proportions. To reach the utmost limit of delicacy it is necessary to add an excess of ammonia before the silver nitrate, and to acidulate afterwards with nitric acid.

2. *The Prussian Blue Test*.—The extreme limit of this reaction was found to be reached with solutions containing hydrocyanic acid in the proportion of 1 to 50,000. Beyond this degree of dilution the results became doubtful.

3. *The Sulphocyanide Test*.—This proved to be the most delicate of all, showing the presence of 1 part of H Cy in 4000,000 parts of the solution. The solution to be tested is mixed with a drop of weak solution of sodium hydrate and a few drops of yellow ammonium sulphide, the mixture evaporated almost to dryness, or until quite colourless, then acidified with hydrochloric acid, and tested with a drop of weak solution of ferric chloride. The authors confirm the advantage resulting from the use of sodium hydrate in this test, as first proposed by H. Struve (see *Year-Book of Pharmacy*, 1874, 140).

The Guaiacum Copper Test.—By means of this reaction it was possible to detect hydrocyanic acid in solutions containing 1 part per 3000,000. The authors employed strips of paper which were soaked in a freshly made alcoholic solution of guaiacum resin (containing 4 per cent.), then allowed to dry and moistened with a drop of copper sulphate solution containing one-fourth per cent. of the salt.

The Reaction with Iodide of Starch.—This was found to be about equal in delicacy with the silver test.

Determination of Hydrocyanic Acid in Cherry-Laurel Water. H. C. Vielhaber. (*Archiv der Pharm.*, cexiii., 408.) The author recommends a process initiated by Pappenheim and Bäderker, according to which the cherry-laurel water, or bitter almond water, is rendered slightly alkaline by magnesium hydrate, then mixed with a few drops of solution of potassium chromate, and titrated with deci-normal silver nitrate. The titration is finished as soon as the red coloration, due to the formation of silver chromate, ceases to disappear. One molecular weight of Ag N O_3 corresponds to one of H Cy. The author obtained results of greater accuracy with this method than with Liebig's.

Test for the Purity of Quinine Sulphate. Dr. O. Hesse. (*Archiv der Pharm.*, cexiii., 495.) The apparatus (quinometer) used by the author is a test tube 10–11 mm. in diameter and 120 mm. long. Near the centre are two marks, the lower of which indicates a volume of 5 c.c. from the bottom, while the distance of the upper mark from the lower one represents the volume of 1 c.c.

0.5 gram of the quinine sulphate to be tested is agitated in a test tube with 10 c.c. of hot water of 50° – 60° C. till dissolved, the solution allowed to cool, and filtered into the quinometer to the height of the lower mark; 1 c.c. of ether is now added, followed by five drops of solution of ammonia, the instrument closed with a cork, gently shaken, and then allowed to stand at rest for two hours. If after that time the ethereal stratum be found free from crystals, the quinine may be regarded as sufficiently pure; but it may still contain 0.25 per cent. of cinchonine sulphate, 0.5 per cent. of quinidine sulphate, and about 1 per cent. of sulphate of cinchonidine and homocinchonidine, as these quantities of impurities remain undetected by this process. Larger proportions of these impurities, however, will cause a distinct separation of crystals in the upper or ethereal layer. The crystals of cinchonidine or homocinchonidine appear granular, while those of cinchonine and quinidine form concentric groups of delicate needles. The separation of crystals takes place immediately, or at least within three minutes, whenever the cinchonidine or homocinchonidine amounts to as much as three per cent., while the presence of two per cent. of these alkaloids generally shows within ten minutes, and that of less than one per cent. causes no separation of crystals even after twelve hours. In order to ascertain, in the latter case, whether these alkaloids are present at all, it is only necessary to loosen the cork of the quinometer, so as to allow a

slow evaporation of the ether, and then to examine the residue with a lens. In the presence of 0.5 per cent. of sulphates of cinchonidine or homocinchonidine, the residue will be distinctly crystalline, while a trace of either will be indicated by the presence of a few crystals imbedded in the amorphous mass of quinine. The presence of these impurities does not prove adulteration, but may be due to want of care on the part of the manufacturer.

0.5 per cent. of sulphate of cinchonine or 1 per cent. of sulphate of quinidine will cause an almost immediate separation of crystals from the ether after shaking. The author regards the presence of these in quinine sulphate as a proof of intentional adulteration, as their chemical properties, as compared with those of quinine sulphate, are such as to render their occurrence in the course of manufacture very unlikely.

The testing of quinine hydrochlorate is done in the same manner as that of the sulphate, with this distinction, however, that 0.25 gram of crystallized sodium sulphate is used along with the 0.5 gram of quinine hydrochlorate at the outset. In every other respect the process is the same. The hydrochlorate is more likely to be contaminated with hydrochlorates of cinchonine and quinidine, than with those of cinchonidine and homocinchonidine.

Test for the Purity of Quinine Sulphate. C. Rump. (*Pharmaceut. Zeitung*, 1879, No. 9.) Referring to the foregoing test of Dr. O. Hesse's, the author suggests as a modification the use of 1 gram of ether in the place of 1 c.c. He regards the latter quantity as insufficient, and thinks that weighing the ether is much more accurate than measuring it in the quinometer. His *modus operandi* is as follows:—0.5 gram of quinine sulphate is placed in an ordinary test tube, together with 10 grams of distilled water; the test tube immersed in hot water for some time, and after the contents have again cooled, 5 grams of the liquid are filtered into another test tube; to this is added 1 gram of ether and from 3 to 5 drops of ammonia water, after which the tube is corked up, shaken, and set aside.

In a subsequent number of the *Pharmaceutische Zeitung* (April 19, 1879, 243) the author mentions a difficulty experienced by him while testing pure quinine sulphate in Hesse's quinometer. He noticed that immediately on the addition of the ether an insoluble gelatinous residue remained, which might easily be mistaken for impurities or adulterations; this, he finds, may be prevented by acidulating the mixture previously, and then adding ammonia, when the quinine yields a clear solution with ether.

Sulphovinates of Quinine. P. Carles. (*Répertoire de Pharm.*, 1878, No. 7) Sulphovinic acid forms two combinations with quinine, one of which is a neutral and the other an acid salt. The latter is best obtained by mixing hot alcoholic solutions of 5·48 parts of crystallized quinine sulphate and of 4·23 parts of sodium sulphovinate, filtering to remove the precipitated barium sulphate, distilling off the greater portion of the spirit, and evaporating the remainder on a water bath. The salt is very hygroscopic and difficult to crystallize. It is freely soluble both in water and alcohol.

For the preparation of the neutral salt, 42·8 parts of quinine are dissolved in 600 parts of strong hot alcohol, and to this is added a solution of 16·9 parts of sodium sulphovinate in 200 parts of the same solvent. The mixture is allowed to cool, the barium sulphate removed by filtration, the alcohol recovered from the filtrate by distillation, and the residue dried at a very moderate heat. Care is required in the drying of the residue, as it is apt to turn red if more than a gentle heat be applied. The salt is soluble in three parts of water, and more freely still in alcohol.

Quinine Tannate. J. Jobst. (*Archiv der Pharm.* [3], xii., 1335. From *Journ. Chem. Soc.*, August, 1878.) Contrary to what is usually stated, tannic acid does not combine with quinine to form a quinine tannate of definite composition, but a compound in which tannic acid may vary indefinitely, and to an extent depending on the method of preparation.

The following analyses of several so-called quinine tannates show that the alkaloid varies not only in quantity, but also in character.

No. 1 had been prepared by precipitating a neutral solution of quinine hydrochlorate with a solution of ammonium tannate. Nos. 6 and 7, which were prepared by adding tannin to an acid solution of quinine sulphate, show that quinine tannates can contain tannin in very large proportion:—

	Water at 120°.	Quinine.	Quinidine.	Cincho- nidine.	Cincho- nne.	Total Alkaloid.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
No. 1 . . .	7·2	31·37	—	—	—	31·37
No. 2 . . .	9·7	22·72	—	—	—	22·72
No. 3 . . .	9·1	4·16	11·97	7·33	—	23·76
No. 4 . . .	9·8	4·93	2·43	13·10	3·35	23·82
No. 5 . . .	10·2	6·23	trace	23·80	trace	27·03
No. 6 . . .	10·7	10·00	—	—	—	10·00
No. 7 . . .	11·4	7·40	—	—	—	7·40

The amount of quinine in No. 1 corresponds nearly with that required by the formula $C_{20}H_{24}N_2O_2 \cdot 2C_{14}H_{10}O_9 + 4H_2O$. and in No. 2 with $C_{20}H_{24}N_2O_2 \cdot 3C_{14}H_{10}O_9 + 8H_2O$.

The bitter taste in these tannates decreases as the proportion of tannic acid in them is increased.

For the author's method of analysing quinine tannate, see *Year-Book of Pharmacy*, 1878, p. 67.

Quinine Arsenite. O. Adler. (*Archiv der Pharm.*, 1879, 43). The author draws attention to the fact that the commercial salt is a mere mixture of arsenious anhydride and quinine, instead of a chemical combination. Pure arsenite of quinine may be prepared by boiling the hydrochlorate with silver arsenite and proof spirit, filtering while hot, and allowing the filtrate to cool. The needle-shaped crystals which thus separate are soluble in 15 parts of cold and in 6 parts of boiling alcohol, in 8 parts of chloroform, 25 of ether, and 20 of benzol; almost insoluble in cold, and soluble in 150 parts of boiling water. Their composition is represented by the formula $(C_{20}H_{24}N_2O_2)_3H_3AsO_3 + 4H_2O$. The commercial salt was found to be a mixture containing 14.2 per cent. of As_2O_3 , 74.6 per cent. of quinine, and 11.2 per cent. of water.

Quinine Carbolate. Dr. Biel. (*Pharm. Zeitschr. für Russland*, 1878, 616.) The author reports that the preparation met with in commerce under this name is either wholly or partly a sulphocarbolate. On fusing it with soda and saltpetre on platinum foil, dissolving the fused mass in water, acidifying with nitric acid, and then adding barium chloride, a copious precipitate of barium sulphate is formed. This was found to be the case with every sample examined.

The Water of Crystallization in Quinidine Sulphate. Dr. O. Hesse. (*Ber. der deutsch. chem.-Ges.*, xi., 1162.) Contrary to Dr. de Vrij's statement that commercial quinidine sulphate is nearly anhydrous (see *Year-Book of Pharmacy*, 1878, p. 29), the author asserts that the water in this salt amounts to 4.60 per cent., of which it loses not more than 1 per cent. at $100^\circ C$. At $120^\circ C$. it parts with the whole of its water, but soon absorbs it again in contact with a moist atmosphere. The composition of the salt is represented by the formula $2C_{20}H_{24}N_2O_2 \cdot H_2SO_4 + 2H_2O$.

Test for the Purity of Commercial Quinidine Sulphate. Dr. O. Hesse. (*Ibid.*) The salt if pure should form a clear solution on agitating 1 gram with 7 c.c. of a mixture of 2 volumes of chloroform and 1 volume of alcohol of 97 per cent.

Another test described by the author is a modification of the

one proposed by Dr. de Vrij (see *Year-Book of Pharmacy*, 1878, p. 29):—

Heat 0.5 gram of the sulphate with 10 c.c. of water to about 60° C.; add to this 0.5 gram of pure potassium iodide, stir well, allow to cool, and, after the lapse of an hour, separate the liquid from the precipitate by filtration. If no other cinchona alkaloids were present, the filtrate remains perfectly clear on the addition of a drop of solution of ammonia; otherwise a precipitate will be formed.

Contribution to the History of the Alkaloids of Ergot. T. Blumberg. (*Pharm. Journ.*, 3rd series, ix., 23, 66, 147, 598.) In a long and elaborate report on the principles of ergot, the author establishes the identity of ecboline and ergotine, and further arrives at the following conclusions:—

(1) That the ergot resin examined by Ganser was a decomposition product of ergotinine; (2) that ether withdraws from ergot, besides the fatty oil, some portion of the active substance; (3) that ergotinine was present in Wigger's ergotine; and that Tanret's ergotinine is probably identical with the author's picrosclerotine, which was mentioned for the first time in the *Pharmaceutische Zeitschrift für Russland*, Oct. 15, 1877. Replying to the last conclusion M. Tanret, in a letter to the *Pharmaceutical Journal* of Feb. 2, 1879, claims priority in the discovery of ergotinine, and shows that he has succeeded in preparing this alkaloid in a pure crystalline state, enabling him to make an ultimate analysis of it; whereas Mr. Blumberg confesses himself to have been unable to ascertain the composition of his picrosclerotine.

Note on the Cinchona Alkaloids. Dr. O. Hesse. (*Pharm. Journ.*, 3rd series, ix., 839.) Mr. J. E. Howard sought to refer the injurious action of the "mixed alkaloids" prepared from the bark of *C. succirubra* to their containing aricine, or an amorphous decomposition product from it. But since this bark contains neither aricine nor the easily decomposable cusconine, with which some authors are wont to confound aricine, and as further it does not yield amorphous substances which can be taken for decomposition products of this alkaloid, the author considers this opinion as unfounded.

It is true, he says, that in 1862 Mr. Howard claimed to have prepared aricine from the bark in question, but in subsequent investigations of it he does not again mention this alkaloid. Probably the substance was only cinchonine, which under certain conditions crystallizes in a form that resembles aricine. The reverse of this

accident almost happened to the discoverers of aricine, Pelletier and Coriol, for they say: "La ressemblance qui se trouve entre ces deux substances nous avais déjà fait penser que c'était de la cinchonine que nous avions obtenue." Nevertheless the two alkaloids are readily distinguishable by their behaviour towards an excess of dilute sulphuric or oxalic acid, inasmuch as aricine is precipitated by these acids, whilst cinchonine remains in solution. The precipitates are crystalline, and so difficultly soluble in water and in dilute acids that they might be taken for sulphate or oxalate of lime respectively. Also if cusconine be present a precipitate is formed by sulphuric and oxalic acids, but these precipitates are gelatinous and do not show the least trace of crystallization.

At the present time the bark in question does not contain the minutest trace of aricine or cusconine. On the other hand, there are found in it besides varying quantities of quinine, cinchonidine, and cinchonine, also the following alkaloids: conquinine, conquinamine, paricine, and two or three other amorphous basic substances; probably also cinchotin.

A notable feature of this bark is the quantity of quinamine it contains, which amounts to about 0.4 per cent. According to the experiments of Prof. Falck, quinamine appears to moderate the temperature of the body in a manner similar to quinine. In a rabbit to which the author administered 0.1 gram of quinamine dissolved in acid by injection into the throat, no lowering of the temperature was observed. Quinamine would therefore appear not to participate in the sometimes peculiar action of the mixed alkaloids.

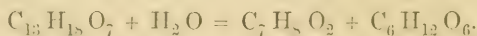
The author believes that the above-mentioned action of the mixed alkaloids is referable to the individual better-known cinchona alkaloids, inasmuch as every person is not similarly affected by them. Under these conditions it would be the business of the physician to determine which substance should be given in a particular case.

Assay of Cinchona Bark. M. Prunier. (*Journ. de Pharm. et de Chim.*, 1879, 136.) 20 grams of cinchona bark in moderately fine powder are intimately mixed with 10 grams of slaked lime and 30 grams of water, and the whole dried in a current of hot air. When dry, the mass is powdered and transferred to a narrow percolator provided at its outlet with a plug of cotton wool, the powder itself being covered with a disc of muslin kept in its place by a piece of lead or some other heavy substance. The mixture is then exhausted with 150 parts of chloroform to which one-fourth of its weight of alcohol of 95 per cent. has been added. The last portions of the menstruum are displaced by water, until a drop or two of the latter

are visible on the surface of the percolate. The latter is distilled in the water bath to dryness. The residue is taken up by a sufficient quantity of dilute hydrochloric acid (10 of acid, 90 of water), the solution is filtered, the filter washed, and the filtrate precipitated by ammonia. The whole of the alkaloids are thus obtained but slightly coloured. They are placed on a filter, washed with dilute ammonia solution (10 per cent.), dried, and weighed. The quinine is then separated by ether, and the remainder, if required, subjected to further processes of separation.

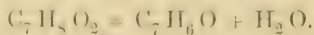
The hydrochloric acid solution of the alkaloids may also be precipitated by sodium bicarbonate in the presence of tartaric acid, in which case the quinine remains in solution.

The Saligenin Test for Salicin. Dr. A. Senier. (*Pharm. Journ.*, 3rd series, ix., 865.) It is stated in text-books of chemistry that when salicin is boiled with water acidulated with hydrochloric or sulphuric acid, it assimilates a molecule of water and is converted into glucose and saligenin. The conversion is expressed thus:—



This reaction is usually commended as a test for salicin, the glucose to be detected by its well-known reducing action on cupric potassium tartrate solution, and the saligenin by neutralizing and adding solution of ferric chloride, with which it gives an intense blue or purplish blue colour.

The author finds that the production of glucose and its detection as just indicated is a simple and certain analytical operation, but that the formation of saligenin, and its colour reaction with ferric chloride, does not afford a trustworthy test. The failure of the last-named reaction is due to the rapid conversion of the newly-formed saligenin into saliretin, a resinous substance, which is insoluble in the acid solution, and is not coloured blue by ferric chloride. It is formed from saligenin by the separation of a molecule of water, as explained by the following equation,—



The author draws attention to the fact that this change was pointed out as early as 1845 by Piria, who recommends the conversion of salicin into saligenin to be effected by fermentation with synaptase. By this means it can be readily obtained in beautiful white tabular crystals, giving the colour with ferric chloride most distinctly, even in dilute solutions. The preparation of the synaptase and subsequent fermentation require so much time, however, that

the author regards this process as impracticable for analytical purposes.

Euphorbone. Dr. O. Hesse. (*Liebig's Annalen*, excii., 193-195. From *Journ. Chem. Soc.*) Euphorbone was obtained from euphorbium by extracting with petroleum ether, and allowing the solution to evaporate spontaneously. On treating the semi-crystalline residue with hot alcohol, and, after the solution had somewhat cooled, pouring off from the deposited resin, crystals separated which were purified by crystallization from acetone.

From his own analyses and those of Rose, Dragendorff, etc., the author deduces the formula $C_{15}H_{24}O$, for euphorbone. This substance is insomeric with lactucone; or perhaps it may possess the double formula, $C_{30}H_{48}O_2$, and so be an isomeride of echicerine. Euphorbone melts at 113° - 114° . For a chloroform solution the rotatory power of euphorbone is $(\alpha)_D = +18.8$ at 15° ; and for an ethereal solution $(\alpha)_D = +11.7^{\circ}$.

Aceto-Nitrate of Iron as a Medicinal Agent. J. Williams. (From a paper read before the Pharmaceutical Society, Dec. 14, 1878, and printed in the *Pharm. Journ.*, 3rd series, ix., 465.) Experiments conducted by the author lead him to suspect that the various salts formed by the combination of peracetate and perntrate of iron, and described by M. Scheurer-Kestner (*Ann. Chim. et Physique*, 3rd series, lxiii., 422; and Watt's "Chemistry," 1st Suppl., 11), may possibly be one and the same salt in a more or less impure condition. He bases this supposition on the observation that upon recrystallization the various salts all appear to yield the same final product.

In the author's opinion, one of the best modes of forming the aceto-nitrate of iron is to dissolve hydrated ferric oxide, which must be quite recent and well washed, in a mixture of glacial acetic and nitric acid, in which the acetic acid is in considerable excess (say two or three parts to one); the hydrated oxide contains sufficient water to dilute the solution, and the oxide must be added slowly, so as to avoid very great elevation of temperature. The solution so formed in twenty-four hours deposits a quantity of the double salt, in hard, well-formed crystals. These, drained from the mother liquor, can be dissolved in a small quantity of warm (not boiling) water, strained if necessary, and allowed to crystallize. The crystals so deposited have all the characters assigned to the tetraceto-dinitrate

of iron of the formula $Fe_2 \left\{ \begin{array}{c} (C_2H_3O_2)_4 \\ NO_3 \\ HO \end{array} \right. + 4Aq.$

The author finds that these crystals are not by any means so easily decomposed as the original description by M. Kestner would lead to infer; on the contrary, they are quite permanent, and so slightly deliquescent that they can readily be kept in paper for several days without spoiling.

They are very soluble in water in the cold or when gently warmed, but the solution is decomposed by boiling, basic compounds being deposited which cannot afterwards be got into solution. It is also freely soluble in alcohol, but practically insoluble in ether.

The various solutions of this salt have a pure styptic taste, quite free from acidity, and not by any means as disagreeable as the tincture of the perchloride.

A difficulty attends the keeping of solutions of this salt, which the author has not succeeded in overcoming. Both the aqueous and alcoholic solutions are liable to gelatinize after being kept a few days or weeks. Tinctures made with absolute alcohol, rectified spirit, and proof spirit equally pectized after a time. A tincture made with equal parts of rectified spirit and water was successful, but it went at last very suddenly and apparently without cause, it having been liquid in the morning and a jelly in the afternoon. The addition of free acetic acid was also tried, but did not prove effectual. Two drams of the nitro-acetate with one ounce of glycerin and three ounces of water formed a perfect solution which had kept well up to the time of the reading of the paper, and therefore promised to be a success.

The author thinks that nitro-acetate of iron, imperfect as it may be in some respects, might prove of considerable use as a medicinal agent, especially if the difficulty of keeping a solution suited for dispensing purposes can be overcome. There has been a want, long felt, of a definite, crystallized, non-deliquescent persalt of iron, and the present salt could be administered in the form of pills with facility, and also in mixtures when the medicine is not intended to be kept long, but taken within a few days of being dispensed. There is also probably an advantage in the fact of the salt containing a large proportion of an organic acid and only a small quantity of a mineral one.

Vanillin from Siam Benzoin. C. Rump. (*Ber. der deutsch. chem.-Ges.*, xi., 1634.) The author has shown the presence of vanillin in Siam benzoin, and now gives the following directions for its preparation therefrom:—2 parts of the powdered benzoin mixed with 1 part of slaked lime are boiled with water, the whole being continually stirred. The solution is filtered, then acidified with

hydrochloric acid, the precipitated benzoic acid removed by filtration, the filtrate agitated with ether, and the ethereal solution allowed to evaporate spontaneously. The vanillin thus left is purified by recrystallization from water, and is finally obtained in the form of long, white needles, becoming yellow on exposure to the air. From its solutions in ether, alcohol, chloroform, and glacial acetic acid it crystallizes in well-defined prisms.

Determination of Nitrogen in Nitrates. A. E. Grete. (*Ber. der deutsch. chem.-Ges.*, xi., 1557.) The author shows that nitrates yield the full theoretical amount of ammonia when ignited with soda-lime and potassium xanthogenate. The latter is obtained by mixing carbon bisulphide with alcoholic solution of potash. The complete reduction of nitrate to ammonia is due to the action of nascent sulphuretted hydrogen produced on heating the soda-lime with the xanthogenate. The same process has also been tried in the determination of nitrogen in albuminoids; and here, too, it has yielded results of theoretical accuracy.

The Determination of the Organic Purity of Potable Waters. C. M. Tidy. (From a paper read before the Chemical Society, Dec. 5, 1878. *Journ. Chem. Soc.*, 1879, 46-104.) The author reviews and criticises at considerable length the principal methods employed for determining the amount of organic contamination of water, viz.:—

The Ignition Process.

The Combustion Process of Drs. Frankland and Armstrong.

Mr. Wanklyn's Ammonia Process.

The Oxygen or Permanganate Process.

The first-named process, to be of any value, pre-supposes three things:—(1) That no organic matter is lost, and none gained during the evaporation of the water; (2) that all the organic matter is burnt off by the ignition of a residue; (3) that nothing but organic matter is lost by ignition. But it is shown to fail in all the three points. The author does not deny, however, that in some cases the loss on ignition may be of value,—as, for example, in cases of sewage,—and that, especially, the odour evolved during the burning is an important feature.

With regard to the second, or "Combustion Process," he argues that it shares one of the defects of the ignition process; and that, in the absence of definite evidence of the non-oxidation and non-volatilization or destruction of any organic matter during the evaporation, determinations made on the residue may lead to erroneous conclusions. He also refers to the acknowledged diffi-

culty of effecting a complete reduction of the nitrates whenever the quantity of the latter exceeds a certain amount. As to the actual combustion of the residue, the author accepts without hesitation the determination of the organic carbon, and is quite satisfied as to the accuracy of the method on this point; but he does not attach the same value to the determination of the organic nitrogen, and does not consider himself justified in drawing definite conclusions as to the source of the organic matter (whether vegetable or animal) from the proportions existing between the organic carbon and nitrogen. Apart from these doubts, however, he considers the process a very valuable one.

The "Ammonia Process" does not appear to find much favour with the author. It is practically impossible to prepare the alkaline solution of potassium permanganate absolutely free from ammonia, and it is equally difficult to fix a point at which the distillation ceases to furnish ammonia, as a resumption of the distillation nearly always results in a further yield of this gas. The process of nesslerizing, moreover, though it gives concordant results in the hands of the same manipulator, often fails to do so when performed with the same sample by different individuals; and this, in the author's opinion, is an almost fatal objection to its general employment. As a rule, the albuminoid ammonia process enables the operator to say whether a sample of water be of excellent quality or of an exceptionally bad quality; but in those more delicate and difficult cases, where a water is not what may be termed excellent, but nevertheless is not "dirty," in the opinion of the author the ammonia process absolutely and entirely fails.

Professor Tidy then passes on to the consideration of the "Oxygen Process," and this, if properly conducted, he regards as the most satisfactory one. He deprecates most strongly the ordinary method of using the permanganate, and gives the following directions for its proper application:—Into two twenty-ounce flasks, cleaned by rinsing with sulphuric acid and then thoroughly washing under the tap, place 500 septems (1 septem = 7 grains = $\frac{1}{1000}$ th of a gallon) of the water; add to each 20 septems of dilute (1 in 3) sulphuric acid, and 20 septems of the permanganate solution (2 grains in 1000 septems). Note the exact time at which the permanganate solution was added; at the same time two similar quantities of distilled water are to be treated in precisely the same manner. At the end of one hour and of three hours the oxygen used up by the water is to be determined. To the flasks, after standing the appointed time, add a sufficiency of potassium

iodide (1 in 10), and then a standard solution of sodium hyposulphite (5.4 grains in 1000 septems), until the whole of the free iodine is removed, judging of the exact point by the addition towards the end of the experiment of a few drops of starch solution. By deducting the quantity of oxygen equivalent to the hyposulphite used from that in the quantity of permanganate originally added, we obtain the quantity of oxygen used by the water. The blank experiments with distilled water give the value of the hyposulphite solution. It is obvious the samples of water must have a pink tint at the end of the one hour or the three hours, otherwise fresh experiments must be made with larger doses of permanganate. The author then proceeds to consider the interference of various substances with the process. He concludes that the only important errors which can arise would be due to the presence of ferrous salts, sulphuretted hydrogen, and nitrites. The presence of the first two substances would be sure to be discovered in the analysis, and by the taste or smell; the nitrites act immediately on the permanganate solution, and any discolorization taking place during the first five minutes must be due to nitrites, and allowed for. Besides, even if a careless manipulator were to miss the iron, the sulphuretted hydrogen, and the nitrites, and estimate the whole as oxidizable organic matter, he would simply condemn a good water, but could never by using the oxygen process pass a bad water as harmless. It is admitted that permanganate fails to oxidize some substances, such as urea; but nevertheless, the quantity of oxygen used affords evidence of the relative quantity of matter in the water which is likely to be injurious, and this is what is wanted in water analysis, as it enables us to speak with confidence as to the use or rejection of a water for drinking purposes. The quantity of oxygen used during the first hour, as compared with that used in the first three hours, gives valuable information as to the relative quantities of putrescent easily oxidizable matter, and of non-putrescent and less easily oxidizable matters. The author also recommends as a valuable accessory the tint of the water as seen viewed through a two-foot tube, two inches in diameter, daylight reflected from a white card being used. This tube is of special value in determining whether a water is peaty or not. In some cases the tint gives a clue to the quantity of organic matter present. The author gives the following illustrations showing the value of the indications of the colour tint as an adjunct to the chemical analysis:—

1. A water exhibits a bluish tint, or, appears nearly colourless in the two-foot tube. It, moreover, uses up very little oxygen

after standing for three hours in contact with permanganate. The freedom of that water from organic impurity may be relied on as certain.

2. A water exhibits but little colour, or at most a slightly yellow, or a greenish yellow tint; nevertheless the oxygen required is found to be large. Such a water as a potable water is suspicious.

3. A water exhibits in the two-foot tube a decided peaty tint. By experiment it is found to need a large quantity of oxygen after standing for three hours. Knowing that peaty matter acts as a reducing agent on permanganate, and the two-foot tube revealing the colour of peat, the quantity of oxygen required although far in excess of what was used in the former case, where there was an absence of colour in the water, is not to be regarded with the same suspicion, peaty matter not being injurious to health.

The author has collected and plotted out in curves the results obtained by Dr. Frankland, using the combustion process; those obtained by Dr. Letheby and himself, using the oxygen process; and those obtained with the ammonia process, with the waters of the eight London companies since 1870. He finds that the curves of the oxygen and combustion processes are strikingly concordant, whilst that of the ammonia process agrees with neither. He divides waters into four classes, according to their relative degree of purity:—

Class I. *Waters of Great Organic Purity*.—In this class Prof. Tidy includes all waters in which the oxygen required to oxidize oxidizable matters does not exceed 0.05 part per 100,000 parts, or 0.035 grain per gallon.

Class II. *Waters of Medium Purity*.—In this class he places all waters in which the oxygen required ranges from 0.035 grain to 0.1 grain per gallon, or from 0.05 to 0.15 part per 100,000 parts.

Class III. *Waters of Doubtful Purity*.—In this class are placed waters where the oxygen required ranges from 0.1 grain to 0.15 grain per gallon, or from 0.15 to 0.21 part per 100,000 parts.

Class IV. *Impure Waters*.—This class embraces all waters where the oxygen required is above 0.15 grain per gallon.

The author wishes it to be distinctly understood, however, that he proposes this classification only for the sake of comparing results, and that he strongly deprecates the judging of a water by one constituent without reference to its complete analysis and natural history. The paper terminates with fifteen conclusions, the substance of which is summed up in the following:—The *Ammonia Process* furnishes results which are marked by singular

inconstancy, and are not delicate enough to allow the recognition and classification of the finer grades of purity or impurity. The errors incidental to the process form an array of difficulties which become infinitely serious, seeing that the range (from 0.05 to 0.1 part per million) between pure and dirty waters is comparatively so small. The *Combustion Process* has all the evils of evaporation to encounter, but the organic carbon estimation is trustworthy; the organic nitrogen determination, however, scarcely yields absolutely trustworthy evidence on which to found an opinion as to the probable source of the organic matter. The *Oxygen Process* avoids the errors incidental to evaporation; its results are constant and extremely delicate; it draws a sharp line between putrescent or probably pernicious and the non-putrescent or probably harmless organic matter. By it a bad water would never be passed as good. As far as the three processes are concerned, the oxygen and combustion processes give closely concordant results, whilst those yielded by the ammonia process are often at direct variance with both.

Water Analysis. A. H. Downes and T. P. Blunt. (*Chem. News*, xxxviii., 296.) The authors call attention to the importance of conducting the determination of organic matter with permanganate solution, in darkness or very subdued light. They have found that in the direct rays of the summer sun a weak solution of potassium permanganate, containing free sulphuric acid, is rapidly decomposed, oxygen is given off in bubbles, the solution loses its pink colour, and a brown deposit of a lower oxide or hydrate of manganese occurs. In their opinion there can be little doubt that broad daylight, when possessing any active power—not, perhaps, in mid-winter—would have an appreciable influence upon such attenuated solutions as those produced by adding the standard permanganate to water in the usual manner.

To check experiments with distilled water afford no safeguard against this source of error, since they serve for the valuation of the hyposulphite solution, and are evidently assumed to represent the original titre of the permanganate.

Identity of Mercurialine with Methylamine. Dr. E. Schmidt. (*Liebig's Annalen*, 193, 73.) Mercurialine is a volatile alkaloid obtained from *Mercurialis annua* and *M. perennis* by E. Reichardt, who found it to have the same composition as methylamine, but to differ from the latter in some of its physical and chemical properties (see *Journal für prakt. Chem.*, 104, 301).

The author has re-examined this substance, and obtained results

clearly proving its identity with methylamine. The latter may be regarded as the first member of a series of substituted ammonias, of which the alkaloids must be regarded as complex members. A large number of other plants were also examined for methylamine, but without success.

The methylamine in *Mercurialis annua* is accompanied by a small proportion of trimethylamine; and from this observation the author concludes that dimethylamine may perhaps also occur in this plant.

Purification of Chloroform. H. Werner. (*Archiv der Pharm.* [3], xii., 450.) The author prepares a perfectly pure chloroform from the commercial article by the following process:—4 volumes of commercial chloroform are agitated with 1 volume of distilled water, and then allowed to stand for twelve hours; after which the chloroform is separated, and left in contact for twenty-four hours with anhydrous (freshly ignited) sodium carbonate. It is then decanted from the soda, and distilled on a water bath at a temperature not exceeding 64° C. The product passing over at this temperature is perfectly pure. The portion distilling at a higher heat may be collected separately and used for external purposes.

Presence of Amylic Alcohol in Chloroform. H. Werner. (*Ibid.*) Upon distilling 5 kilograms of commercial chloroform until less than 100 grams remained in the retort, the author noticed that the residue gradually separated small yellowish drops, possessing the odour of fousel oil. He submitted the residue to fractional distillation, and found that the boiling point remained constant at about 62° C., until only 4 to 5 grams were left, when it quickly rose to 66° C., at which point the distillation was stopped. The residue, on being now distilled with potassium bichromate and sulphuric acid, yielded valeric acid.

Pelletierine, the Alkaloid of Pomegranate Bark. M. Tanret. (*Comptes Rendus*, lxxxvii., 358. From *Pharm. Journ.*) The author, who recently announced the discovery of this liquid alkaloid (see *Year-Book of Pharmacy*, 1878, p. 43), has communicated the following additional information respecting it to the French Academy of Sciences.

The alkaloid is obtained in a pure state by distilling its ethereal solution in a current of hydrogen, and maintaining the residue at a temperature of 130°–140° C., until it no longer gives off the vapour of water. The temperature is then raised, and the liquid collected that distils between 180° and 185° C.

Pelletierine so obtained is colourless, but in the open air or in

flasks incompletely filled it becomes coloured very rapidly. At zero its sp. gr. is 0.999, and at 21° C. 0.985. It is very soluble in water, with which it undergoes a contraction of volume; a mixture of 1 part of pelletierine with 2.5 parts of water having, at 21° C., a sp. gr. of 1.021.

Pelletierine is dextrogyre, having in aqueous solution a rotatory power of $[\alpha]_D = + 8^\circ$, that of the sulphate prepared with the distilled alkaloid is $+ 5.9^\circ$. With sulphuric acid and potassium bichromate pelletierine gives a green colour, as intense as that produced by alcohol under the same conditions.

Analyses of the alkaloid as well as of the crystalline salts it forms with sulphuric and hydrochloric acids indicate the formula $C_8H_{13}NO$. It therefore furnishes another example of a volatile oxygenated base, near to conhydrine, $C_8H_{17}NO$, and tropine, $C_8H_{15}NO$.

Some experiments were made in order to ascertain the amount of the alkaloid contained in the bark from different parts of the plant, and the influence of vegetation on its formation. The bark used was all taken from ten-year-old plants grown in Troyes, in the open air during summer and in a greenhouse in winter. The results obtained, therefore, are considered to be comparable between themselves, although plants grown entirely in the open air under a warmer sky might yield different quantities of the alkaloid. The following figures show the yield in sulphate from 100 parts of bark:—

	Gathered	
	June 10.	Aug. 3.
Fibrillæ, entire, dry	—	1.30
Bark of fibrillæ, obtained by contusion, dry .	0.66	2.25
Meditullium of fibrillæ, dry	—	0.63
Bark of roots larger than a pigeon's feather, fresh	0.60	0.92
Ditto, dry	1.20	1.54
Bark of large and medium-sized branches, fresh	0.34	0.37
Ditto, dry	0.68	0.66
Bark of small branches, dry	0.32	—

The author states that the result of physiological experiments made at his request by several medical men in Paris and Troyes, has been to demonstrate that pelletierine is the tænicide principle of the pomegranate.

Cinchotenicine. Dr. O. Hesse. (*Ber. der deutsch. chem.-Ges.*, xi., 1983.) A solution of one molecular weight of cinchotenine (a derivative of cinchonine) in dilute sulphuric acid containing one molecular weight of H_2SO_4 , was found to leave on slow evaporation an

amorphous residue, which when heated to 120° C. becomes crystalline, and when subsequently fused at a temperature of 140° – 150° C., was converted into amorphous sulphate of cinchotenicine, without any appreciable alteration in weight. By dissolving the dark brown product in water, removing the sulphuric acid by baryta water, and the excess of the latter by carbonic acid, a brownish yellow solution was obtained, which, after treatment with animal charcoal and evaporation, left cinchotenicine as a dark brown amorphous substance yielding a yellow powder. It was found to be soluble in water, alcohol, chloroform, dilute acids, and in solutions of alkaline hydrates; but insoluble in ether. It fused at 153° , and suffered decomposition when heated to 180° .

Cinchotenicine possesses all the chemical characters of an alkalioid. It is dextrorotatory, and differs from cinchotinine by being more easily acted upon by boiling nitric acid.

Detection and Approximate Determination of Minute Quantities of Alcohol. J. C. Thresh. (From a paper read before the Pharmaceutical Society, Nov. 6, 1878, and recorded in the *Pharm. Journ.*, 3rd series, ix., 408.) The author's method is based on the well-known reaction of aldehyde with caustic alkalies.

The requisites are a saturated solution of bichromate of potash, a dilute sulphuric acid (B. P. acid and water, equal quantities), a syrupy solution of caustic soda, methylated spirit free from aldehyde, a 200 c.c. flask with good condensing arrangement attached, and a long narrow test tube graduated to 3 and 23 c.c.

100 c.c. of the dilute alcohol are placed in the flask, 2 c.c. of bichromate solution, 8 c.c. of the dilute acid, and a few pieces of pumice are added, and 20 c.c. distilled (not too rapidly); the distillate is conveyed by a long tube to the bottom of the test tube, in which has been previously placed 3 c.c. of the soda solution. The liquid in the tube is then heated, kept at the boiling point for a few seconds, and placed aside for a couple of hours. If 1 per cent. of alcohol was contained in the original solution, the contents of the test tube will be of a deep yellow colour, and will have deposited flocks of aldehyde resin; with .05 per cent., no resin is formed, but the fluid is deep yellow and perceptibly opalescent; with .01 per cent., the colour is just perceptible, but the characteristic odour is still very distinct. To make a more accurate determination, dilute 1 part of pure aldehyde with 200 of water, to this add .30 parts of the caustic soda solution, and treat in the same way as the above distillate. After the lapse of two hours (the reaction not being complete for nearly this length of time) dilute with 200 parts

of warm methylated spirit, and add water to 500 parts. This solution is quite clear and of a reddish yellow colour, and will keep for some time, especially if not exposed to the light. Mix 5 c.c. of this solution with 45 c.c. of water in a glass such as is employed for nesslerizing, and take this as a standard solution. It does not keep more than two or three hours, hence fresh standards must be from time to time prepared, or a solution of bichromate of potash made of equal depth of colour (the tint being almost identical), and kept as a standard of reference. To make the quantitative determination, dilute the distillate with sufficient warm spirit to make a clear solution, and add water to 50 c.c. Upon ascertaining the quantity of this solution, which must be diluted with water to 50 c.c. to bring the depth of colour to that of the standard solution, the percentage of alcohol in the original solution is immediately known. The following are fair specimens of the results obtained:—

Strength of Alcoholic Solution.						Strength calculated from result of experiments.
·02 per cent.	.	.	.	.	.	·012
·1 "	.	.	.	.	.	·089
·1 "	.	.	.	.	.	·1
·1 "	.	.	.	.	.	·088
·1 "	.	.	.	.	.	·092
·2 "	.	.	.	.	.	·166
·2 "	.	.	.	.	.	·208
·05 "	.	.	.	.	.	·039
·2 "	.	.	.	.	.	·170
·4 "	(3 c.c. $K_2Cr_2O_7$ Sol.)				.	·308

Having ascertained the reliability of the method, where the alcohol was diluted with water only, the effect of the presence of other substances was tried. Städeler has shown that albumin, fibrin, gelatin, and lactic acid, yield a trace of aldehyde when treated with sulphuric acid and bichromate of potash, or peroxide of manganese; hence these compounds must be removed from solution before the test is applied. No substances, with these exceptions, besides the ethyl compounds are known to yield aldehyde when thus treated. Various essential oils, chloroform, amyl alcohol, etc., were shaken with water and the solution distilled with these oxidizing agents, but no yellow colour was produced. The distillate from clove water was pink; but when ·1 per cent of alcohol was added, the pink tint was quite overpowered by the yellow colour of the aldehyde resin produced. Ether of course yields aldehyde when oxidized; hence this test will not serve to detect alcohol in

ether. To detect alcohol in essential oils and chloroform, agitate the sample with an equal quantity of water, and when the aqueous solution has become clear, remove with a pipette and distil with bichromate and acid. 0.5 per cent. is thus easily detected. The subjoined table gives the results of several quantitative experiments. 4 c.c. of the substance examined were shaken vigorously with 8 c.c. of the dilute acid and 92 c.c. of water, and when clear 50 c.c. of the acid liquid placed in a flask and distilled with a sufficient quantity of bichromate. 10 c.c. of distillate are collected in a tube containing 2 c.c. of soda solution, and boiled, diluted, and nesslerized.

Name, etc.	Quantity of Bichromate	
	Solution added.	Result.
Oil of Lemons	2 c.c.	none.
„ „ with 5 p.c. Alcohol	2 „	3.6 p.c.
„ Rosemary, with 5 p.c. Alcohol	2 „	3.9 p.c.
„ Bergamotte	2 „	none.
„ „ with 10 p.c. Alcohol	2 „	9.7 p.c.
„ Lavender (English)	3½ „	none.
„ „ (foreign).	3½ „	3.6 p.c.
„ „ „ with 2½ p.c. Alcohol	3½ „	6.3 p.c.
„ „ „ washed	3½ „	none.
A pure Chloroform	2 „	a trace.
„ „ with 5 p.c. Alcohol	2 „	4.2 p.c.
„ „ with 1 p.c. Alcohol	2 „	.92 p.c.

The oil of lavender (exot.) was undoubtedly adulterated, since after being washed with water, and examined, no reaction was obtained. Deducting 3.6 from 6.3, we have 2.7 as the percentage of alcohol added.

Alcohol is said not to suffer decomposition in presence of pure water. To confirm this a sample of well-boiled water had .1 per cent. of alcohol added, and determinations made daily. After ten days the quantity of alcohol was found undiminished. An impure tank water to which .1 per cent. of alcohol had been added did not contain a trace twenty-four hours afterwards. The presence of decaying organic matter of all kinds has this effect, and no doubt this reaction is in some degree a measure of the quality of a water.

Rajewsky (*Pflüger's Archiv*, xi., 122, see *Year-Book of Pharmacy*, 1876, 125), when investigating the action of alcohol upon the system, its passage into the brain and muscle, and the length of time which it remains there, came to the conclusion that the iodoform test is either not applicable to the detection of alcohol in the tissues, or

that alcohol is a normal constituent of brain and muscle. The author has applied the aldehyde test to a number of infusions of fresh muscle, or rather to the distillate from this infusion, but has failed to detect the slightest trace of alcohol.

The chromic acid reaction is still often quoted as a test for alcohol in the urine, but as shown by Chaumont (see *Year-Book of Pharmacy*, 1875, 147), the test is not to be relied upon even when applied to the distillate. A number of experiments were tried with various samples of urine, with and without the addition of alcohol. By adding a sufficient quantity of bichromate to oxidize all the oxidizable matter present in the urine, good quantitative results were obtained. By distilling the urine and estimating the alcohol in the distillate, the results were all much too low; but when about a gram of ferrous sulphate was added to the urine previous to distillation, the results were much more approximate. Should the urine contain albumen, it must be distilled, and the distillate examined; but otherwise equally good results are obtained without distillation. Two hours after partaking of an alcoholic fluid, distinct traces of alcohol are found in the urine. The quantity (after taking 12 c.c. of absolute alcohol) in the urine after two hours was about 0.2 per cent., and about the same proportion was found ten hours afterwards, and traces were present for upwards of twenty-four hours. After forty hours no alcohol could be detected. From the quantity of urine excreted, the results of two determinations went to show that not more than .7 per cent. of the alcohol taken passes into the urine unchanged.

By concentrating fluids supposed to contain alcohol, by one or more distillations, exceedingly minute traces can be detected by this process, especially if only one-tenth instead of one-fifth be distilled.

By-Products in the Manufacture of Beet Sugar. (*Dingl. polyt. Journ.*, 230, 263.) Within the last year or two several improvements have been introduced by the French in the working of the molasses residues from the beet-root sugar manufacture. These residues, after treatment for the extraction of the potash salts, are now submitted to dry distillation, and several most valuable products are obtained. In the distillation gases and tar are formed, together with a large amount of condensed water. The latter alone is important. From it is obtained ammonium sulphate, methyl alcohol, and large amounts of crude tri-methylamin salts. The methyl alcohol is all sold for use in the manufacture of anilin colours; while the tri-methylamin salts, by a new process of Vincent, the chief promoter

of this industry, are decomposed with the production of methyl chloride, an extremely volatile liquid boiling at 23° C. This is used in the formation of artificial ice, and also in the manufacture of anilin colours containing methyl. This fine utilization of what was long regarded as purely a waste product was considered as one of the most striking improvements in applied chemistry shown at the late Paris Exhibition.

Professor Roscoe, in a lecture delivered at the Royal Institution, gave a striking illustration of the value of methyl chloride as a freezing agent, by solidifying before his audience a mass of mercury of several pounds weight into a hard solid, which could be hammered like a piece of lead.

Guaiacum as a Test for Copper. H. Purgotti. (*Gazzetta Chimica Italiana*, viii., 104.) Schönbein's well-known reaction of cyanides with guaiacum and copper sulphate, which was subsequently shown by the author and others to be shared by ferro-cyanides, sulpho-cyanides, and cyanates, as well as the chlorides of the alkalis and the alkaline earths, is now used by the author as a very delicate test for copper. The solution, which must be quite free from all substances turning blue with guaiacum, is mixed with a solution of an alkaline chloride, and allowed to flow gently into a spirituous solution of guaiacum. If copper be present in even so small a proportion as 1 in 100,000, a blue coloration will be produced at the point of contact between the two liquids.

The alleged Conversion of Quinine into Quinidine in the Human Organism. M. Personne. (*Pharm. Journ.*, 3rd series, ix., 125.) The author has been engaged in some researches to ascertain whether, as asserted by M. Guillochin, quinine is converted into quinidine during its passage through the human system, or undergoes any other important modification. By treating with tannin the urine from patients under antiperiodic treatment, and converting the precipitate into sulphate, he has obtained a considerable quantity of perfectly white crystallized quinine sulphate, but no quinidine. In one case, where 2 grams of the crystallized sulphate were administered, M. Yvon, effecting the precipitation with pure tannin, obtained from the urine 0.3 gram.

Quantitative Determination of Precipitates without Filtering, Washing, and Drying them. R. Popper. (*Zeitschr. für analyt. Chem.*, 1879, 14-38. From *Journ. Chem. Soc.*) This is the continuation and conclusion of a previous paper by the same author (*Chem. Soc. Journ.* [2], 1877, 638). The author in the present communication explains a more simple method of determining the

sp. gr. of precipitates, and gives results obtained by the method when applied to some generally occurring precipitates. The formula employed is derived from that already given (*loc. cit.*), and the letters represent the quantities there stated. It is the following:—

$$S = \frac{N - (G - g)}{N} . s.$$

The sp. gr. (S) of the precipitate is determined by precipitating from the solution of a weighed quantity of a pure salt a known weight (N) of the precipitate. This avoids the inconvenience and loss of time incurred in washing the precipitate, and further gives its sp. gr. under the usual conditions of its formation.

Ferric Hydrate.—The method is useful for correcting the weight of a precipitate of aluminium hydrate when mixed, as is often the case, with a small known quantity of iron as ferric hydrate. The sp. gr. of the ferric hydrate precipitate was obtained by using known weights of Mohr's salt of ascertained purity. The mean of four fairly concordant results gave $S = 2.72$. These results varied more widely than usual, probably on account of the apparently capricious differences in the state of hydration of this precipitate.

Barium Sulphate.—For this precipitate, the mean of four very concordant results gave $S = 4.525$, and this number closely agrees with results published by Rose.

Mercuric Sulphide.— $S = 7.346$, a very satisfactory mean. This was considered the most useful precipitate for the estimation of mercury, because in solutions sufficiently diluted small quantities of nitric acid, ferric chloride, and even *aqua regia* had no bad influence, especially when the process was quickly carried out.

Nickel Hydrate.—The mean of three determinations gave $S = 4.36$.

Lead Sulphate.—Lead is most readily separated as sulphate from most of the metals associated with it in ores. In applying this method, excess of sulphuric acid must be added, and the co-efficient of expansion of the dilute acid is slightly different from that of water, and varies also with the strength of the acid. In precise experiments the author used 1 volume of acid to 40 of water. This acid has a co-efficient of expansion of 11 compared with pure water as 8. For ordinary purposes this difference may be neglected, as the error incurred is not higher than 0.1–0.2 per cent. As a mean of four experiments, $S = 6.380$.

The method was tested further by applying it to the estimation of mercury, aluminium, and sulphuric acid, in a mixture in known

proportions of mercuric chloride, ferrous sulphate, and potash alum. After dissolving the substance in water and acidifying with hydrochloric acid, the mercury was precipitated with sulphuretted hydrogen, and liquid and precipitate made up to a litre in a litre flask. When the mercuric sulphide had settled, a portion of the liquid was syphoned off through a filter, as described in the former paper (*loc. cit.*), and its sp. gr. determined. The sp. gr. bottle was then filled with this liquid, and the precipitate weighed. The mercury found was 30.67 per cent., against 30.75 put into the mixture. Two portions of 400 c.c. each of the decantate were then boiled until free from sulphuretted hydrogen. In one the iron was determined by permanganate; the other was precipitated by ammonia after oxidizing the iron with nitric acid. The weight of the precipitate of ferric and aluminium hydrate was determined by the author's method; allowing for the known quantity of iron, the weight of aluminium was found. The weights found were aluminium 2.45 per cent., iron 3.39, against 2.41 and 3.36 respectively put into the mixture. The sulphuric acid found in the liquid decanted from the precipitate with ammonia was 23.02 per cent. by this method, against 23.086 actually present. The method is suggested for estimating impurities remaining as residues, such as barium sulphate left from adulterated zinc-white when treated with hydrochloric acid; also for the estimation of cadmium sulphide left undissolved when cadmium and tin sulphides have been treated with ammonium sulphide. The author is satisfied that the sp. gr. of a precipitate may be considered invariable, except in cases like calcium carbonate, when the precipitate may exist in two modifications.

In conclusion, the author gives numerous precautions to be observed. Amongst them are the following:—The liquid above the precipitate, unless already mixed by boiling or the passage of a gas, must be vigorously stirred to render it homogeneous. Large quantities of dissolved substances should be avoided, as they affect the co-efficient of expansion. The precipitate and liquid should be weighed before the liquid alone, as the small quantity of the former liquid is more rapidly affected by evaporation than the latter; and both weighings should be made as rapidly as possible, to avoid difference of temperature. The temperature should be read to the tenth of a degree, and the ordinary precautions taken to avoid errors by heating with the hand or neighbouring flames after reading the temperature. When such obviously requisite precautions are attended to, the results are uniformly satisfactory.

Copaivic Acid. W. B. Rush. (*Amer. Journ. Pharm.*, 1879, 305.)

In preparing copaivic acid the volatile oil must first be removed, which is usually done by distillation with steam. The oil is, however, much more readily separated on a small scale by one of the following processes:—First, by dissolving ten parts of copaiba in ten parts of benzin, adding an equal part of caustic soda solution (sp. gr. 1·30), and agitating well; or, secondly, by mixing ten parts of copaiba, ten of alcohol and four of soda solution, when the mixture will separate into three layers. A third and most economical way for separating the volatile oil is to shake together three parts of the soda solution with one of the copaiba. After separation, pour off the volatile oil, decant the alkali solution, pass a stream of water over the resin, to wash off adhering particles of alkali, and let it dry. Next, dissolve the resins in benzin, and agitate the solution with very diluted hydrochloric acid until the aqueous liquid remains slightly acid to litmus. Let the mixture rest until the resin and water have separated, decant the water and evaporate the benzin solution to a thick syrupy mass, and allow to cool. The same resins are thus obtained which are left on the distillation of the volatile oil.

The author has observed that if the percentage of oil is below 5·5, it does not separate, there being sufficient resin to hold the volatile oil combined; and in this condition some of the latter is oxidized or altered. It may be separated from the resin by dissolving in benzin or alcohol and treating as above.

The resinous residue left after the separation of the oil contains an acid, a neutral and a soft resin. The following are among the processes for the isolation of the different *resins of copaiba*:—Liquefy the resins by the heat of a water bath, pour into about twice the weight of petroleum benzin, stir until dissolved, filter, and allow to evaporate spontaneously. A few particles will remain on the filter, consisting of the usual impurities. Warm the residue left by evaporation over a water bath, and pour it into three times its quantity of alcohol; or heat the alcohol to the boiling point, mix thoroughly, and filter whilst hot. The portion left on the filter is the neutral resin. Set the filtrate aside for several days to crystallize. Treat a portion of the neutral resin with hot alcohol, and should the latter become coloured, treat repeatedly with the same liquid in order to remove any acid resin still adhering.

The *neutral resin* is a yellowish powder without taste or odour, and neutral to test paper; it softens in hot alcohol, and is soluble in ten times its weight of hot chloroform.

After crystals have formed in the alcoholic liquid, filter, and dry on the filter paper under a bell jar. On distilling off the alcohol from the filtrate, the soft resin is left behind. Copaic acid may also be obtained from the resin by dissolving it in benzin, filtering and evaporating. The residue is heated to 200° F., dissolved in pure naphtha, filtered while warm, and set aside to crystallize, after which the crystals are dried under a bell jar.

Of the other processes which have been tried, the following deserve to be briefly mentioned:—

Dissolve the oleo-resin in liquor ammonia (sp. gr. 95), and expose this in a shallow dish at a temperature below 60° F., until hardened; then, dissolve in wood naphtha, crystallize and filter. Expose the copaiba to the air in shallow dishes until it has become hard and brittle, dissolve it in ammonia water, and leave to evaporate in a cool place; then dissolve in hot alcohol, filter, and set aside to crystallize. Dissolve the resins left after the distillation of volatile oil in ammonia, allow to evaporate, dissolve in hot alcohol, filter, and set aside to crystallize. The alcohol may be partly recovered in these different processes by distillation.

The crystals cannot be easily obtained without the previous separation of the volatile oil, the acid being soluble in fixed and volatile oils. Doubtless the copaiba yielding the largest amount of resins will produce the most acid.

Copaic acid forms soft prismatic crystals, which are soluble in strong alcohol, ether, fixed and volatile oils. Its alcoholic solution reddens litmus, is not precipitated by potash or soda, yields with an alcoholic solution of acetate of lead a crystalline precipitate: but, on adding to it an alcoholic solution of nitrate of silver, no precipitate is occasioned until a little ammonia is added. A white crystalline powder falls, which is with difficulty soluble in alcohol, but readily soluble in ammonia.

The Detection of Starch as an Adulterant in Cocoa. Prof. Wittstein. (*Zeitschr. des oesterr. Apoth. Ver.*, Sept. 1, 1878, 399.) The starch naturally contained in cocoa is so enclosed in the fat and other constituents that it is not acted upon by hot water, and the filtered decoction therefore gives no reaction with iodine. The author takes advantage of this fact, previously observed by him in the detection of starch or flour fraudulently added to the cocoa. The sample is boiled with water, the decoction filtered through paper till quite clear, and then tested with solution of iodine.

Determination of Theobromine in Cocoa and Chocolate. (G.

Wolfram. (*Diagl. polyt. Jouru.*, cexxx., 240. From *Amer. Jouru. Pharm.*) If shelled cocoa-beans are to be analysed they are ground up in a hot mortar to a thick paste. 10 grams of this mass, or 20 to 30 grams of chocolate, are digested for some time in hot water, treated with ammoniacal lead acetate, filtered whilst hot, and washed with hot water until the acidified filtrate ceases to give a precipitate with sodium phospho-tungstate. The filtrate is tested with caustic soda, and the liquid evaporated to 50 c.c., acidified with sulphuric acid, and the lead sulphate removed by filtration. The filtrate is precipitated with a large excess of phospho-tungstate. The separation of the slimy yellowish white precipitate, in flakes, is facilitated by warming and stirring the mixture gently. After several hours' standing the liquid is filtered and washed with 6 to 8 per cent. of sulphuric acid. The filter and the precipitate are then treated in a beaker with an excess of caustic baryta, the mixture warmed, the excess of barium hydrate neutralized by means of sulphuric acid, and any excess of the latter thrown down with barium carbonate. The liquid containing the theobromine in solution is filtered whilst hot, and the precipitate washed with hot water. The filtrate is evaporated in a platinum dish, and the residue dried and weighed. Since, besides theobromine a small quantity of baryta salts is always dissolved in the liquid, the alkaloid is removed by ignition, the residue moistened with ammonium carbonate, evaporated, heated, re-weighed, and the difference between the two weighings calculated as theobromine.

Detection of Morphine in Poisoning Cases. Prof. Selmi. (*Moniteur Scientifique*, August, 1878.) In the detection of morphine in the viscera, ether dissolves a little of this alkaloid if the alkaline liquid is left for twenty-four hours in contact with it. If the viscera are recent, morphine may be detected with certainty. Chloroform in the cold does not dissolve the morphine contained in the viscera. This solvent may be employed to separate a part of the cadaveric alkaloids and some other impurities. A portion of the morphine present in the viscera is decomposed during the operation. Purification with basic lead acetate and sulphuretted hydrogen is useful for decolorizing the aqueous extract, but the precipitate of lead sulphide may retain a portion of the dissolved alkaloids. An anhydrous alcohol solution of tartaric acid may serve to remove certain cadaveric alkaloids accompanying the morphine. In the putrid viscera the morphine is decomposed, and seems to be replaced by a derivative which possesses certain of its reactions, but which is deprived of the most characteristic. The detection of a derivative of

morphine ought not to be considered satisfactory proof that the viscera contain this base. Half a milligram of morphine, dissolved in 4 or 5 drops of sulphuric acid, yields, on the application of heat, a violet liquid. When cold this solution gives the following reactions:—If saturated with bicarbonate of soda, nothing; but on adding a drop of tincture of iodine, a green colour. With a drop of chlorine water the violet passes to a cherry-red, which becomes green on neutralizing with bicarbonate of soda. With a drop of the solution of lead tetra-chloride, a cherry-red coloration more intense than that produced with chlorine water, and also turning green with bicarbonate of soda. With bromine water the violet becomes almost blood-red, which turns to an intense green on saturation with bicarbonate of soda. With iodic acid the violet is intensified. With nitric acid the cherry-red first produced becomes yellow, and on saturation with ammonia turns to a brown. Red prussiate gives a fine cherry-red coloration.

Separation of Antimony and Arsenic. Prof. R. Bunsen. (*Liebig's Annalen*, 192, iii. From *Chem. News*.) The author points out as a source of error in the determinations of arsenic, that the ammonio-arsenate of magnesium retains its crystalline water a little below 100° , to the extent almost of an atom, but gives it up at temperatures between 102° and 105° . If this compound is to be used as a means of separation, it is preferably dissolved upon the filter in nitric acid, and the solution, after evaporation to dryness in a platinum crucible, is converted by heat into bibasic arseniate of magnesium, and weighed as such. Still all such determinations of arsenic cannot lay claim to an even moderately satisfactory degree of accuracy, since the ammonio-arsenate of magnesia, like the sulphate of baryta, obstinately retains salts from the precipitating liquids, and a prolonged washing with ammonia is impracticable, since 30 c.c. of the latter dissolve about 1 milligram of the precipitate. Many of the determinations of antimony as hypo-antimonic acid are also inaccurate. The temperature at which antimonious acid passes into hypo-antimonic acid, borders very closely upon that at which the latter begins to be resolved into oxygen and antimonious acid. The author therefore rejects these methods of determination, as well as the processes for the separation of arsenic and antimony hitherto in use, and proposes the following:—

The sulphides of arsenic and antimony, while still moist, are dissolved upon the filter in an excess of solution of pure potash (purified by alcohol). The solution, together with the concentrated washings, is introduced into a porcelain crucible, holding

about 150 c.c., and a rapid current of chlorine is introduced into the liquid through a hole in the watch glass, which serves as a cover, till all the alkali is neutralised. The crucible, still covered with the watch glass, is heated in the water bath, and concentrated hydrochloric acid in great excess is dropped in by means of a pipette. The liquid is evaporated down to half its bulk, the loss is again made up with an equal volume of concentrated hydrochloric acid, and the liquid again concentrated down to one-half or one-third, in order to expel all free chlorine. It can now be diluted to a perfectly limpid solution, by the addition of very weak hydrochloric acid, without tartaric acid, the latter of which interferes with the separation. To this solution there are now added for every decigram of antimonious acid probably present, about 100 c.c. of a recently prepared and *saturated* solution of sulphuretted hydrogen, when penta-sulphide of antimony is precipitated immediately, or after a short time, according to its larger or smaller proportion. As soon as this precipitate has separated itself, the excess of sulphuretted hydrogen is immediately removed from the solution, by forcing through it a rapid current of air, filtered through cotton wool. This is easily effected by means of the blast of a glass-blowing table. To prevent loss by spiriting, the beaker must be kept covered with a perforated watch glass, the air pipe entering through its aperture. In about fifteen to twenty minutes the air is expelled, and the liquid becomes inodorous. The precipitate is then thrown upon a weighed filter and washed with the filter-pump, the filter being filled in succession eight or ten times with water, twice with alcohol, four times with sulphide of carbon, and finally three times with alcohol. The precipitate is dried at 110° in the salt bath, at which temperature it remains for any length of time perfectly constant in weight. The washings, even in not very experienced hands, do not require more than an hour. The filtrate, which contains the arsenic as arsenic acid, does not retain the least trace of antimony. The antimonial precipitate may in certain cases retain quite insignificant traces of arsenic. But if after washing with water it is redissolved in hydrate of potash, and the process of separation repeated, the antimony is obtained free from any trace of arsenic. The determination of arsenic in the filtrate and washings is no less simple. The collected liquid, after the addition of a few drops of chlorine, is heated on the water bath, and treated with a prolonged current of sulphuretted hydrogen, both whilst hot and during cooling. The precipitate is allowed to settle for a day at a gentle heat, and is then placed upon

a weighed filter. If care has been taken to leave a sufficient excess of sulphuretted hydrogen in the liquid during its heating and cooling, the resultant precipitate consists of a little sulphur and arsenic penta-sulphide, without the least admixture of trisulphide. Before weighing, it is treated exactly like the antimonial precipitate. Its composition and weight are constant after drying at 110° .

Notes on the Detection of Arsenic in Poisoning Cases. Prof. Selmi. (*Moniteur Scientifique*, Sept., 1878. From *Journ. Chem. Soc.*) When arsenic is deposited in the form of a ring or a spot, one of the methods for its recognition consists in oxidizing the deposit with nitric acid, evaporating gently to dryness, dissolving the residue in water, and testing with ammoniacal nitrate of silver. If during the oxidation arsenious acid is produced, a yellow precipitate falls; but if arsenic acid, the precipitate is a brick red. In practice, and especially when the quantity of arsenious acid is small, the complete oxidation of the arsenic is difficult, the evaporation having to be very carefully conducted for fear of volatilising a little arsenious acid not yet transformed. If the treatment with nitric acid is not several times repeated, it may happen that the slight precipitate with nitrate of silver appears of an uncertain reddish yellow tint, which passes rapidly to a brown by the decomposition of the arseniate of silver. The author finds that the reactions of arsenious acid are more distinct than those of the arsenic, the light yellow precipitate of the former passing less readily into a brown than does the arseniate. In order to make certain that arsenious acid shall always be produced, he operates as follows:—The part of the tube containing the arsenic is cut off with the file, so as to form a small glass ring containing the product. It is placed vertically in a capsule, and a few drops of nitric acid are allowed to fall upon it from a pipette, in such a quantity only that it may remain enclosed by the capillarity of the tube. If the ring of arsenic is slight, it is dissolved almost instantly; if it is somewhat thick, time is required. In case it does not dissolve completely, the liquid is removed with a pipette, and the acid renewed, touching with an iron wire slightly heated the *outside* of the tube opposite the place where the undissolved arsenic lies until it is completely taken up. The nitric acid used is prepared by mixing 1 volume of pure nitric acid, of sp. gr. 1.25, and 1 volume of distilled water. The liquid is withdrawn and the tube rinsed with a few drops of distilled water. Ammonia is added till the reaction is alkaline, and if the volume is too considerable, the whole is concentrated in the water bath. After concentration

a little more ammonia is added. A drop of a neutral and very dilute solution of silver nitrate is allowed to fall into the liquid. If a yellow precipitate is formed, the author observes that a second, third, and fourth drop added successively augment the precipitate. The precipitate is allowed to settle, the liquid is removed as completely as possible with blotting-paper without touching the precipitate, and it is treated with hydrosulphate of ammonia. The yellow precipitate dissolves, and silver sulphide remains. The precipitate is dissolved in weak nitric acid, and the silver is thrown down with a few drops of hydrochloric acid. The liquid is filtered, mixed with sulphuretted hydrogen, and kept at a gentle heat for twenty-four hours, when the arsenic re-appears as sulphide. Another reaction of arsenic indicated by Fresenius and Pettenkofer is of great use for converting the arsenical ring directly into arsenic sulphide by means of a current of sulphuretted hydrogen. The regularity of this reaction has been called in question, but the author has repeated it several times, and always with complete success. If two or three arsenical rings have been produced, this reaction may be employed as a check-test. For this purpose the ring is inserted in the delivery tube of an apparatus producing pure sulphuretted hydrogen, and the part of the tube where the arsenic lies is gently heated, when the metallic aspect of the ring changes to a yellow, more or less inclining to orange, the ring not being displaced. The tube is allowed to cool, and there is poured into it a little sulphide of carbon, which dissolves the free sulphur deposited around the ring. On pouring away the liquid, the arsenical deposit appears much more beautiful. The ring in a tube may be also treated as follows:—A few grams of zinc sulphide obtained by precipitation, and mixed up with water so as to form a paste, are introduced into the ends of the tube. The same end is then plunged into a few c.c. of dilute sulphuric acid, and the ring is heated, when the sulphide is produced.

Gauthier's process for the detection of arsenic is modified by the author as follows:—100 grams of the suspected matter are heated with 20 grams of pure nitric acid until reduced to a yellowish pulp. The heat is then withdrawn, and 5 grams of sulphuric acid are added. The mixture is heated again till white fumes begin to escape, when 10 to 12 grams more of nitric acid are added, and heat is applied till a small portion gives with boiling water a dark yellow liquid. It is then filtered, washed repeatedly to ensure complete exhaustion, the liquid evaporated, and the residue taken up repeatedly with hot nitric acid until the solution becomes a

light yellow. Sulphurous acid is then added in excess, the liquid is saturated with sulphuretted hydrogen, and left for a day at a luke-warm temperature, taking care that there shall be always an excess of sulphuretted hydrogen. On operating in this manner there is neither loss of arsenious acid during carbonization, nor is any arsenic retained in the organic matter.

The Detection of Ergot in Flour. Dr. E. Hoffmann. (*Pharmaceut. Zeitung*, 1878, No. 84.) The method recommended by the author is a modification of that proposed by C. A. Wolf:—10 grams of the suspected flour, 15 grams of ether, and 10 drops dilute sulphuric acid (1:5) are repeatedly shaken together and allowed to stand for half an hour, when they are placed on a filter and washed with ether until the straw-coloured filtrate amounts to 10 grams. If this is shaken with 5 drops of a saturated aqueous solution of sodium bicarbonate, the latter will immediately separate again and will settle, possessing scarcely any colour in case the flour is strictly pure and contains no ergot, while all chlorophyll will remain in the ethereal solution. The presence of $\frac{1}{10}$ per cent. of ergot in the flour will cause a handsome violet coloration of the sodium-bicarbonate solution, which then holds all the colour of the ergot. By this method the author claims to be able to detect the presence of $\frac{1}{50}$ per cent.; he also succeeded in determining by this method the presence of ergot in a mixture of cinnamon, orange-leaves, and ergot; and in a mixture of sausage, bread crusts, vegetables, brown sauce, and ergot.

Distilled Oil of Lemon. Dr. W. A. Tilden. (*Pharm. Journ.*, 3rd series, ix., 654.) The oil examined by the author was prepared by Mr. John Moss. It had a pale yellow colour, and a most deliciously fragrant odour of the peel; superior, in the author's opinion, to that of the foreign essence.

Upon distillation a few drops of water came over first, and the thermometer then mounted to 177° , at which temperature the liquid began to distil. The products of the distillation were as follows:—

Temp. C.	Distillate.
At 177° – 180°	190 c.c. (a)
„ 180° – 185°	52 c.c. (b)
„ 185° – 190°	15 c.c. (c)
„ 190° – 250°	20 c.c. (d)
Residue, about	3 c.c.

The following substances were recognised among the fractions: (1) A turpentine, $C_{10}H_{16}$, agreeing in general properties with terebinthene. (2) A terpene, $C_{10}H_{16}$, for which the name of

citrene may be retained, and which constitutes at least 70 per cent. of the crude oil; this terpene differs but slightly from the corresponding terpene of orange as to odour, and boils at the same temperature, 176° ; but it is distinguished by the formation of terpene hydrate when treated with nitric acid and alcohol, whereas hesperidene yields no terpene (hydrate?). Citrene treated with strong sulphuric acid yields an inactive hydrocarbon, boiling at about 176° , whilst hesperidene yields a viscid product, distilling above 240° . (3) Cymene, about 6 per cent. (4) Distillates *c* and *d* consist chiefly of an oxidized compound, $C_{10}H_{18}O$, boiling above 200° , resembling terpinol, except that it is dextrorotatory. (5) The viscid residue consists of polymeric hydrocarbons, $(C_{10}H_{16})_n$, and also of a compound ether, $C_{10}H_{17}(C_2H_3O)O$, which is decomposed by heat into $C_{10}H_{16}$ and acetic acid.

Mr. John Moss, in the *Pharmaceutical Journal* of March 29, p. 798, gives a full account of the manner in which his distilled oil of lemon was prepared.

Gnoscopine. T. and H. Smith. (*Pharm. Journ.*, 3rd series, ix., 82.) In the mother-liquors from the purification of narceine the authors have now repeatedly met with a crystalline body, which, distinguished at first from the principles more generally met with in opium by its melting point and slight solubility in spirit, was, upon closer examination, ascertained to be a hitherto unknown alkaloid, which they have named gnoscopine.

This principle is characterised by forming readily crystallizable salts, which have an acid reaction. That its salts possess this reaction, as also the fact that gnoscopine is quite insoluble in water and in alkalies, marks its strong resemblance to the papaverine group. Hence, also, it is easily separated from narceine, which is moderately soluble in boiling water and freely so in alkalies.

Gnoscopine when pure (after being repeatedly crystallized from boiling spirit) forms long thin white needles, having a woolly character when dried. It is soluble in 1500 parts of cold spirit. It melts at 233° C., decomposing, however, at the same time, and burning with a smoky flame, leaving a skeleton of charcoal that burns entirely away at a high temperature. It forms a muriate which crystallizes in glassy prisms, apparently containing water of crystallization, which is lost at a moderate heat. A solution of this salt gives a buff-coloured crystalline precipitate with platino chloride of potassium, and a white precipitate with iodide of mercury and potassium. In pure sulphuric acid, gnoscopine dissolves with a slightly yellow colour, and becomes at once

carmine-red upon the addition of a trace of nitric acid, and remains so. In this respect gnoscopine differs from rhæadine, which assumes this red colour upon the addition either of sulphuric or hydrochloric acid alone. Gnoscopine is insoluble either in aqueous or spirituous solutions of caustic soda, also in mineral spirit, and in fousel oil; but is soluble in chloroform and bisulphide of carbon, and slightly so in benzol.

The authors have made three analyses of gnoscopine, the results of which lead to the formula $C_{34}H_{36}N_2O_{11}$.

Analytical Application of Glycerin. E. Donath. (*Dingl. polyt. Journ.*, 229, 542.) The property which glycerin possesses of dissolving certain metallic oxides and hydroxides, and of preventing the precipitation of others by fixed alkalis, has been known for some time. Puls has recently investigated and described some metallic glycerides, on the formation of which probably these appearances depend.

By experimenting in this direction, the author found that a mixture of glycerin and solution of caustic soda (sp. gr. 1.2) in equal volumes has the property of dissolving the higher oxides of certain metals. The precipitation of manganous oxide by fixed alkalis, for instance, is not prevented by glycerin; but if the precipitate is exposed to the air for a short time only, a deep cherry-red solution is formed. A similar result is obtained on treating the precipitate formed by sodium hypochlorite and manganese solutions with the above mixture. The precipitation of nickelous and cobaltous oxides by potash is also not prevented by glycerin; in the latter case a green solution containing cobalt is obtained owing to slow oxidation in the air. Mixtures of glycerin and caustic soda, or ammonia, possess distinct reducing properties.

The black nickel hydroxide obtained by heating solutions of nickel with sodium hypochlorite is reduced by glycerin and soda already in the cold; the cobaltic oxide produced in a similar manner being less readily reduced in the cold, but more readily on heating. When a mixture of glycerin and ammonia is used, to which a small quantity of sal-ammoniac solution is added, nickelous oxide dissolves, forming a blue solution, whilst only very small quantities of cobalt dissolve even after some time. This reaction may be employed to detect small quantities of nickel in presence of larger quantities of cobalt. The reaction of the glycerin soda solution with copper and cadmium oxides, the former being dissolved and not the latter, serves not merely for their detection, but may also be used for their accurate quantitative separa-

tion. For qualitative purposes the corresponding metallic sulphides are dissolved in dilute, warm nitric acid, and treated with glycerin and soda solution. If copper alone is present a blue solution is obtained; whilst in the presence of cadmium, insoluble cadmium hydroxide is simultaneously formed, which is filtered off, washed, and is easily recognised by conversion into the sulphide. To separate both metals quantitatively, their solution is treated with an excess of glycerin soda in a platinum or porcelain dish, warmed for about twenty minutes on a water bath; after which the separated cadmium oxide is filtered off, washed first with hot water containing glycerin soda solution, and finally with pure water; it is then dried and ignited, using the precautions necessary, owing to the volatility of the possibly reduced cadmium. The mass is then weighed as cadmium oxide. In the filtrate, copper may be precipitated by heating with grape sugar, igniting the precipitate, and weighing it as cupric oxide; or the filtrate may be treated with ammonium chloride, and titrated with potassium cyanide. The results are satisfactory in both cases. The precipitation of alumina and chromium oxide by ammonia is not in the least interfered with by the presence of glycerin, as is the case with tartaric acid; as the solvent property of glycerin soda solution, in respect of certain metallic hydroxides, is greater than that of tartaric acid in the presence of free alkalies, the former may be used in many cases with advantage instead of tartaric acid, *e.g.*, in the separation of alumina, chromium, and iron oxides.

Quinetum. A. C. Oudemans. (*Archives Néerlandaises des Sciences*, xiii. From *Chem. News*.) The author has analysed the crude mixture of alkaloids known as *quinetum*, which he finds composed as follows:—

Cinchouine	37.0
Quinine	6.1
Cinchonidine	22.9
Quinamine	4.5
Amorphous Alkaloids	21.1
Carbonate of Soda	2.9
Water	2.7

He regards this mixture as a suitable source for the preparation of quinamine.

The Solubility of Sulphur and Phosphorus in Organic Acids.
Dr. G. Vulpius. (*Archiv der Pharm.*, cexiii., 229.) L. Liebermann's observation of the solubility of sulphur in concentrated acetic acid induced the author to try the solvent action of various

organic acids both on sulphur and phosphorus. He found that phosphorus also was soluble in strong acetic acid to an appreciable extent, and that minute quantities of sulphur and phosphorus could be dissolved in formic acid of 1.220 sp. gr. At 100°C ., 1 part of sulphur required 2,800 parts of the latter to effect complete solution, from which part of the sulphur, however, separated on cooling. Phosphorus was still less soluble, the strongest solution obtainable containing not more than 1 in 10,000. Hot stearic acid took up appreciable quantities of phosphorus and considerable quantities of sulphur. From these observations the author concludes that these two substances will probably also be soluble in propionic, butyric, and other fatty acids.

Presence of Furfural in Commercial Glacial Acetic Acid. V. Meyer. (*Ber. der deutsch. chem.-Ges.*, xi., 1870.) The author finds furfural to occur in commercial glacial acetic acid in the proportion of 0.108 gram per litre. Its presence therein is the cause of a peculiar colour reaction with aniline previously noticed by him. In contact with the latter the acid produced a beautiful red coloration, which was not obtained from the same acid previously distilled from chromic acid.

Decomposition Products of Cinchonine. Prof. Filletti. (*Atti della R. Accademia Lincei*, March, 1879. From *Chem. News*.) The author dissolved 15 grams of cinchonine in a slight excess of hydrochloric acid, diluted the solution to 4 litres, saturated it with chlorine, and exposed it to the direct action of light. A white or slightly yellow substance was deposited on the sides of the beaker. This deposit dissolves in glacial acetic acid, and is reprecipitated by water. On heating cinchonine with bromine and water for several days in a closed tube, he obtained products the examination of which is still incomplete.

Oxidation of Quinine by Potassium Permanganate. S. Hoogewerff and W. A. v. Dorp. (*Ber. der deutsch. chem.-Ges.*, xii., 158. From *Journ. Chem. Soc.*) When quinine sulphate is oxidized at a boiling heat by potassium permanganate in alkaline solution (8.5–9.5 grams K Mn O_4 to 16 grams dry quinine sulphate), from 22 to 26 per cent. of its carbon is obtained as oxalic acid, and from 41.2 to 43.4 per cent. of its nitrogen as ammonia. The resulting alkaline liquid contains, besides other nitrogenous bodies, about 15 per cent. (of the sulphate of quinine) of a tribasic acid, $\text{C}_8\text{H}_5\text{N O}_6$, probably *tricarbo-pyridenic acid*, $\text{C}_5\text{H}_2\text{N}(\text{COOH})_3$. This acid retains $1\frac{1}{2}$ molecules of water of crystallization at 100° , which it loses at 120° . It blackens at 190° , and melts at

244°. It is sparingly soluble in cold water, easily in hot water or alcohol, and almost insoluble in ether or benzine. Heated with lime in excess, it gives off the odour of the bases from Dippel's oil. The barium, calcium, silver, potassium, and copper salts of this acid are described.

Quinidine and cinchonine apparently yield the same acid. In many respects it resembles the acid similarly obtained by Ramsay and Dobbie (*Ber.*, 11, 324), and named by them dicarbo-pyridenic acid.

Decomposition Products of Quinine and the allied Alkaloids. J. J. Dobbie and W. Ramsay. (From a paper read before the Chemical Society, Feb. 20, 1879; *Chem. News*, xxxix., 92.) In a previous paper the authors gave the results of their experiments on the oxidation of quinine by permanganate. (See abstract in the *Year-Book of Pharmacy*, 1878, p. 67.) In the present paper the authors have extended their investigation to the oxidation-products of quinidine, cinchonine, and cinchonidine. All these bodies yield, by oxidation with permanganate, acids which are physically and chemically identical. This acid the authors prove by analysis, etc., to be tricarbo-pyridenic acid. They give in detail the method employed. More than 10 per cent. of the acid was so obtained from each base. The paper contains an account of the properties and form of crystallization of the acid, with many analyses. The acid is tribasic. Potash, soda, ammonia, silver, calcium, barium, strontium, zinc, and copper salts were prepared, and are described. The formula deduced from the analysis of the acid and its salt is $C_8H_5NO_6 + 1\frac{1}{2}H_2O$. The result of the present investigations confirms the conclusions previously arrived at by the authors, viz., that there is a close relation between the cinchona bark alkaloids and the bases of the pyridin series, and proves that the four principal alkaloids derived from cinchona bark all yield, on oxidation, the same acid. In conclusion the authors draw attention to the fact that their first paper was published, March, 1878, and that in the *Ber. der deutsch. chem.-Ges.*, Feb. 11, 1879, is a paper by Hoogewerff and Van Dorp, which confirms the authors' researches as regards quinine (see the previous article).

Solubility of Cinchonine in Various Solvents. M. Prunier. (*Journ. de Pharm. et de Chim.*, 1879, 135.) The conflicting statements of different authors relative to the solubility of cinchonine have induced the author to reinvestigate this subject. He finds 1 part of the pure crystallized alkaloid to be soluble in 84.28 parts of alcohol of 95 per cent., in 101.62 parts of pure chloroform, and in

108.00 parts of amyllic alcohol. Certain mixtures of these solvents take up considerably more of the alkaloid than any one of them used by itself. The best solvent was found to be a mixture of 4 parts of pure chloroform, and 1 part of alcohol of 95 per cent. Of this 13.47 parts were sufficient for a complete solution of 1 part of the alkaloid.

Determination of Sulphuric Acid in Urine. E. Baumann. (*Analyst*, 1878, 240.) This method is based on the fact that "sulphuric ethers" existing in urine are not decomposed when gently heated with acetic acid, but are readily decomposed when heated with a small quantity of hydrochloric acid. The sulphuric acid present as salts is determined by mixing 25 to 50 c.c. of the urine with acetic acid, and adding an equal bulk of water and excess of barium chloride. The whole is heated on a water bath for three-quarters of an hour, and the baric sulphate collected and weighed. The filtrate from this is boiled with hydrochloric acid until the precipitate separates out completely, when it is filtered and washed with hot alcohol to remove resins, etc., which are thrown down at the same time. This gives the amount of sulphuric acid as ethers; the former precipitate the amount as salts.

The Detection of Mercury in Urine. Dr. P. Furbringer. (*Berlin. Klin. Wochenschrift*, 1878, No. 23. From *Pharm. Journ.*) The Schneider Ludwig method of detecting quicksilver in animal tissues and liquids, by the electrolytic process, and amalgamation with copper and zinc filings, subsequent reduction of the amalgam by heat, and production of a combination of mercury and iodine, has been improved by the author, who recommends the following mode of proceeding:—In 500 to 1000 c.c. of urine, previously acidulated by some mineral or strong vegetable acid, and heated to 60° or 80° C., 0.25 or 0.5 gram of fine brass shavings are immersed, and stirred for about ten minutes. The urine is poured off, and the brass shavings, which have taken up and amalgamated with the mercury, washed in succession with hot water, absolute alcohol, and ether, to remove all organic matter. Albumen and glucose in such urine do not at all impede the electrolytic extraction of the mercury; but the presence of purulent and mucous deposits necessitates previous filtration. After the ether has evaporated, the spongy metal is thoroughly dried by squeezing it in filter paper, and then pressed into a solid spindle-shaped mass, which is put into a capillary glass tube of 0.8 cm. interior diameter, and 15 cm. length. Both ends of the tube are to be drawn to a thinner volume, of at least 0.1 cm. diameter, the amalgam remaining inside the wider middle part of

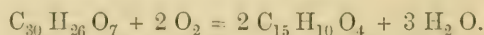
about 4 cm. length. By rotating the latter cautiously over a Bunsen's lamp, and not allowing the temperature to exceed the beginning of a dark red heating of the metal, the amalgam becomes reduced, and annular deposits of quicksilver formed in the narrow capillary tube ends, generally also some deposits of zinc oxide will be formed, but they always appear as rings inside the quicksilver. The yellow and red combinations with iodine are produced by putting a few grains of this metal inside, and heating slowly over a very small flame. The red rings of biniodide that form will show for years, and quantities down to 0.00025 gram of mercury have shown distinct reactions in a course of several hundred urine examinations. With quantities of only 0.0001 gram the test sometimes failed, no red rings made their appearance; but this happened to the author likewise with the more circumstantial examination by Ludwig's method. The author promises to adapt his method for testing other animal liquids, and it is to be hoped he will improve it for the purpose of qualitative tests. It need not be remarked that it applies to all pharmaceutical preparations of mercury, and will be of especial interest and value in determining the quantities of excreted metal in courses of bichloride treatment, inunction, mercury baths, and in cases treated by large calomel doses. In cases of acute poisoning by corrosive sublimate, the secretion of urine is either scanty or altogether suppressed; so that attempts to ascertain the presence of mercury in the kidney secretions would be, very likely, unsuccessful.

Detection and Estimation of Chlorates in Urine. O. Hehner. (*Analyst*, 1878, 236. From *Journ. Chem. Soc.*) When potassium chlorate is administered, about 94 per cent. of it passes out of the system in the urine; but whether the other 6 per cent. is decomposed in the body or is evacuated with the fæces, the author is unable to decide. In order to estimate the amount of chlorate in the urine, the author tried the method of reduction with the copper zinc couple, but the process was unsatisfactory, from the frothing of the liquid and the long time required for complete reduction. An eminently satisfactory and simple method, however, is to precipitate the chlorides in a measured quantity of the urine with excess of silver nitrate, and after removal of the silver chloride, to render the filtrate acid with sulphuric acid, and add metallic zinc. If the liquid be gently warmed, the reduction is complete in about half an hour, and the hydrochloric acid produced may be estimated in the clear liquid in the usual way. A very good qualitative test is to add an acid solution of ferrous sulphate to the solution after

removal of the chloride as above. On heating, the chlorate is reduced, and silver chloride is thrown down.

Chrysarobin, the principal Constituent of Goa Powder. C. Liebermann and P. Seidler. (*Ber. der deutsch. chem.-Ges.*, xi., 1603.) Some years ago Dr. Attfield published the results of an analysis of Goa or araroba powder, showing this drug to contain from 80 to 84 per cent. of chrysophanic acid, along with 2 per cent. of resin, $5\frac{1}{2}$ per cent. of woody fibre, and 7 per cent. of bitter extractive. The authors now show that this chrysophanic acid does not pre-exist in Goa, but that the latter contains a substance readily converted into it, which they propose to call chrysarobin; and that the chrysophanic acid obtained by Dr. Attfield was an oxidation-product of this substance.

Chrysarobin is the chief constituent of Goa powder, from which it can be extracted by boiling benzene, and purified by repeated crystallization from glacial acetic acid. It dissolves in concentrated sulphuric acid with a yellow colour, and forms with strong solutions of caustic potash a yellow solution showing a dark greenish fluorescence. In weak potash solutions it is insoluble. When fused with caustic potash it yields a brown mass. All these reactions distinguish it from chrysophanic acid. On passing air through its alkaline solution an alkaline chrysophanate is formed, from which chrysophanic acid can be readily obtained by precipitation with acids and crystallizing from petroleum spirit. The formula of chrysarobin is $C_{30}H_{26}O_7$. Its conversion into chrysophanic acid is explained by the following equation,—



Whether the therapeutic action of Goa powder is to be attributed to chrysarobin or to its oxidation-product is a point which remains yet to be ascertained.

Further Notes on the Analysis of Crude Tartars. A. Scheurer-Kestner. (*Bull. Soc. Chim.* [2], xxix., 451. From *Journ. Chem. Soc.*) Tartars frequently contain, besides potassium bitartrate, neutral calcium tartrate, which in some samples is found in large quantities; calcium sulphate is also occasionally present.

Estimation of Potassium Bitartrate.—This salt is generally estimated by means of a standard solution of potash or soda, or else the same is calcined, and the residue, consisting of carbonates, titrated with standard acid. But this method cannot be relied on in the presence of calcium tartrate, unless a determination is made of the latter and deducted from the total alkali. Calcium sulphate

also interferes by its action on the potassium carbonate. In the absence of calcium salts, the titration of the residue after calcination gives exact results; but the direct estimation of the acid with standard alkali is liable to error, as some tartars, more especially lees, contain acid organic products other than tartaric acid. Therefore, in the presence of calcium tartrate the calcined mass should be dissolved in water, and the solution titrated with standard acid; but even then an error will be introduced if calcium sulphate is present.

Estimation of Calcium Tartrate.—The following method gives good results. The tartar is calcined, dissolved in water, filtered, washed, and the filtrate titrated; the cream of tartar is then calculated from this estimation. The residue on the filter (Ca C O_3) is also titrated, and calculated as calcium tartrate. Calcium sulphate should always be tested for, as it vitiates the results by being precipitated as calcium carbonate (when water is added to the calcined residue), and so finally calculated as calcium tartrate. In the presence of calcium sulphate, only an approximation can be made of the relative amount of potassium bitartrate and calcium tartrate, and even this is not possible when the sample contains other acid substances besides tartaric acid. But in the absence of such acid substances, by estimating the bitartrate with a standard solution of alkali, and the total tartaric acid (that combined with the calcium as well as the potassium) as calcium tartrate, the proportions of the salts originally present may be calculated. When, however, foreign acid substances are present, the author finds that the following process gives exact and concordant results:—

The sample is dissolved in hydrochloric acid, filtered, and to the filtrate calcium chloride is added, and the tartaric acid precipitated as calcium tartrate by means of caustic soda, not in excess. To avoid the precipitation of calcium hydrate, ammonia is used to precipitate the last portions. Ammonia may be employed instead of caustic soda, but then as small a quantity as possible of hydrochloric acid should be used, as calcium tartrate is somewhat soluble in ammonium chloride. The calcium tartrate is collected on a filter, washed, calcined—it need not be previously dried—and estimated volumetrically. An experiment made with 10 grams of pure cream of tartar gave 9.947. A mixture of cream of tartar, calcium, sulphate, and calcium tartrate gave,—

	Calculated.	Found.	
		I.	II.
Potassium Bitartrate . . .	92.3	92.5	91.8
Calcium Tartrate (total) . .	128.2	128.5	127.5

An experiment made with a mixture of 10 grams of cream of tartar and 2 grams of calcium sulphate proved the whole of the calcium to be precipitated as tartrate on addition of alkali to the acid solution.

Tannin Estimation. F. Kathreiner. (*Dingl. polyt. Journ.*, cexxviii. 53. From *Journ. Chem. Soc.*) From experiments made on Löwenthal's method, the author concludes that:—(1) The permanganate solution should not contain more than 1.33 gram of the crystallized salt per litre. (2) The indigo solution should be such that 20 c.c. = 10 c.c. of permanganate. (3) The solution of gelatin and sodium chloride (25 grams gelatin dissolved in water, saturated with pure sodium chloride, and made up to 1 litre with a saturated solution of salt) should be kept well corked, and filtered before using. (4) The concentration of the tannin solution should be such that 10 c.c. may require about 6 c.c. of permanganate solution.

To determine the "non-tannin" constituents oxidizable by the permanganate, 50 c.c. of water containing 2.5 grams of sulphuric acid are added to 100 c.c. of the solution, stirred up with 100 c.c. of the gelatin solution; and after standing all night the solution is filtered, and a measured portion of the filtrate is titrated.

The time required for titrating is about four minutes for the original solution, and about six minutes for the "filtrate."

The author recommends Löwenthal's method, and cites other opinions in its favour. He criticises unfavourably Hammer's method, and condemns Clark's and Jean's methods.

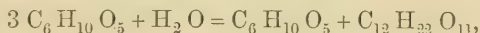
New Method for preparing Nitrogen. Prof. Gibbs. (From *Polyt. Notizblatt.*) The author obtains nitrogen in a very pure state by gently heating a mixture of 10 grams of finely powdered potassium bichromate, 10 grams of ammonium nitrate, and the same quantity of sodium nitrate, with 90 c.c. of water. The water is placed in a flask capable of holding twice the quantity, and the bichromate and the two nitrates are then added successively. The orifice of the flask is then closed with a perforated cork supplied with a bent glass tube, and a gentle heat applied to the mixture.

Presence of Copper in Liquor Ammonia. A. Schwalm. (*Pharmaceut. Zeitschr. für Russland*, Aug. 15, 1878, 483.) The author draws attention to the occasional occurrence of copper in commercial liquor ammonia of perfectly colourless appearance. Its presence is readily detected by treatment by sulphuretted hydrogen, and the examination of any precipitate thus formed.

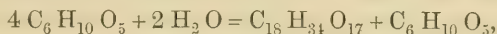
Quantitative Separation of Nickel and Zinc. F. Beilitun. (*Ber. der deutsch. chem.-Ges.*, xi., 1715.) The largely diluted solution

containing the two metals is rendered ammoniacal, and then acidified with citric acid. Sulphuretted hydrogen, now passed in excess through the cold solution, will precipitate the whole of the zinc, leaving the nickel in solution. The precipitate is collected on a filter, and weighed; while the filtrate is evaporated to a small bulk, then saturated with ammonia, and the nickel precipitated by electrolysis. The author claims for this process an amount of accuracy not attained by any other method used for this purpose.

Estimation of Diastase. M. Baswitz. (*Ber. der deutsch. chem.-Ges.*, xi., 1443. From *Journ. Chem. Soc.*) By treating an excess of starch with a known quantity of malt extract, and determining the amount of sugar formed, the author thought to be able to draw conclusions as to the amount of diastase present in the malt. When these experiments are made in vessels freely exposed to the air, however, the results vary considerably, owing to the presence of carbonic acid. Experiments were therefore made in a current of carbonic acid and also in an atmosphere free from carbonic acid; from which it appears that the amount of sugar formed is greater in the former than in the latter. The maximum point is reached in about two and a half to four hours. Supposing the formation of sugar from starch to take place as follows,—



then 100 parts of starch should yield 70·37 parts of maltose. If, however, the reaction takes place thus,—



then 100 parts of starch should yield 80·9 parts of maltose.

The maximum obtained by the author is 67·3, unaltered starch being still present. It would thus appear that the diastase in this reaction uses up a portion of itself, and cannot convert an infinite quantity of starch into sugar. The author concludes that 1 part of malt is about equivalent to 60–70 parts of dry starch material. Pressure in presence of carbonic acid influences unfavourably the formation of sugar.

Estimation of Diastase. W. R. Dunstan and A. F. Dimmock. (*Pharm. Journ.*, 3rd series, ix., 733.) The authors have devised the following method, which differs from the processes hitherto in use, in dealing with the direct action of diastase upon starch, independent of the products of that action. They have applied it with success in the estimation of the relative value, as regards dias-

tase, of different kinds of malt extract, and find that it enables them to determine their starch-converting power with great accuracy.

Two flasks of about a quarter litre capacity are selected, and into each from .1 to .3 gram of starch, previously dried at from 180° F. to 212° F., is added. About 100 c.c. of water are poured into each; and both are heated with constant agitation over a Bunsen burner until the starch is all gelatinized, as diastase has no action on ungelatinized starch. The flasks are then cooled down to 100° F., 10 grams of the malt extract, or solution containing the diastase, are made into a solution with 100 c.c. of water. To one of the above flasks a certain number of c.c. of the diluted solution containing diastase are added, and to the other just twice that amount. The flasks are now allowed to remain for three hours at a temperature of 100° to 120° F. At the expiration of this time a drop of the solution out of the flask to which the largest amount of diastase solution had been added, is placed on a white porcelain plate, and near it is placed a drop of a dilute solution of iodine in iodide of potassium. If, when the two drops are mixed, any colour results, more of the solution of diastase must be added. Then the flask containing the smaller amount must be tested in the same way. If any colour be produced, more diastase solution must be added, until the exact point is reached when no colour is produced; three hours being allowed between each addition of the diastase solution.

Further details respecting this process will be found in the original article.

Derivatives of Starch. MM. Museulus and Gruber. (*Comptes Rendus*, lxxxvi., 1459. From *Journ. Chem. Soc.*) Under the influence of dilute boiling sulphuric acid, or of diastase, the following different substances are produced from starch:—

1. *Soluble Starch*.—This substance is insoluble in water at 50° – 60° . It is coloured wine-red by iodine when it is in aqueous solution, and blue when it is in the solid state. Dried in the air with excess of iodine, it assumes violet, yellow, or brown tints. Its rotatory power is $[\alpha] = +218^{\circ}$, and its reducing power is 6.

2. *Erythrodestrin*, which constitutes half of the dextrin of commerce, always strikes a red colour with iodine, whether it be solid or in solution. It is never insoluble in water. The smallest quantity of diastase easily attacks soluble starch as erythrodestrin.

3. *Achroodestrin* α , is not coloured by iodine. Rotatory power $[\alpha] = +210^{\circ}$; reducing power, 12. Partially convertible into sugar by diastase, but less easily than soluble starch or erythrodestrin.

4. *Achroodestrin* β , not attacked by diastase, at least during the

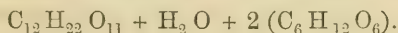
first twenty-four hours. Rotatory power $[\alpha] = +190^\circ$; reducing power, 12.

5. *Achroodextrin* γ , not attacked by diastase at all; changed into glucose by boiling with dilute sulphuric acid for several hours. Rotatory power $[\alpha] = +150^\circ$; reducing power, 28.

6. *Maltose* ($C_{12}H_{22}O_{11} + H_2O$); attacked with difficulty by fermentable diastase. Rotatory $[\alpha] = 150^\circ$; reducing power, 66.

7. *Glucose* ($C_6H_{12}O_6 + H_2O$); fermentable. Rotatory power $[\alpha] = +56^\circ$; reducing power, 100.

The authors regard starch as a polysaccharide of the formula $n(C_{12}H_{20}O_{10})$, in which the exact value of n , which apparently is not less than 5 or 6, remains to be determined. Under the influence of diastase ferments and of dilute acids, this hydrate of carbon by successive stages takes up water and breaks up into maltose and a new dextrin of successively smaller molecular weight; n becomes less for each stage, until the production of the achroodextrin γ , which is probably transformed into maltose by simple hydration, and the maltose in its turn takes up water and splits up thus,—



Action of Diastase on Starch. M. Maercker. (*Landw. Versuchs-Stat.*, xxii., 69.) Musculus asserts that three parts starch yield 2 of dextrin and only 1 of sugar; whilst Schwarzen's results, confirmed by the author, obtained at the temperature of $48^\circ R.$, showed 1 of sugar to 1 of dextrin. This sugar is not dextrose but maltose, which has only two-thirds of the reducing power of the former; and as half of the reducing power of the product resulting from the action of diastase on starch is due to maltose, the four-starch-groups must yield 3 of maltose and 1 of dextrin. At higher temperatures varying results have been obtained. At 65° , the yield of maltose is lowered by several per cent.; at a still higher temperature, a tolerably constant relation holds between the maltose and dextrin (two-starch give 1 maltose and 1 dextrin). Possibly there are two diastase ferments, one of which produces much maltose and little dextrin, but is destroyed while the temperature is still comparatively low; while the other, destroyed at higher temperatures only, produces less maltose and more dextrin. The second diastase ferment appears not to act upon dextrin, whilst fresh unwarmed diastase readily converts the dextrin into sugar. The action of acids on diastase is similar to that of heat: in small quantity they act like a temperature of 52° – 56° (more dextrin formed), whilst more acid entirely stops the action.

Conversion of Starch into Glucose by Carbonic Acid. MM. Bachet and Savalle. (*Pharm. Centralhalle*, xix., No. 44.) The authors have found that the action of carbonic acid upon starch is analogous to that of mineral acids, either at a low or higher temperature, the maximum of energy being reached at 60° C. If a mixture of a ground farinaceous substance with water saturated with carbonic acid be maintained at 60° C. for about six or seven hours, a liquid will be obtained which, after fermentation, yields a quantity of alcohol equal to the amount of starch present. When carbonic acid is introduced into the chamber to raise the pressure to eight atmospheres, an hour suffices for the reaction. Finally, the presence of gluten aids the saccharifying process, provided, however, the same be not exposed to a temperature exceeding 60° C. This process may prove advantageous in the manufacture of dextrine, glucose, beer, whisky, and so forth. It is also a very economical one, inasmuch as it obviates the employment of malt or mineral acids, and lessens the number of workmen required. The gas is a copious by-product of every fermentation, and may consequently be obtained free of expense, while after the operation the same may be recollected in a gasometer by boiling the finished liquid. It should also be remembered that beverages prepared in the above manner cannot possibly be contaminated or exhibit any objectionable foreign taste.

The Volatile Oil of *Thymus Serpyllum*. Dr. E. Buri. (*Archiv der Pharm.*, 212, 485.) The author submitted this oil to fractional distillation, and collected it in four portions, boiling respectively at about 180° , 204° , 220° , and 350° F. On agitating these fractions with water, acetic and another acid was taken up, the mixture of the two having an odour resembling that of butyric acid. None of the fractions yielded a crystalline compound with bisulphite of potassium. By agitating with potash solution and treating the latter with ether, both before and after acidulating it, two phenols were obtained, that from the alkaline liquid being about 3 per cent. of the weight of the oil, colourless; coloured ferric chloride yellowish green, and yielded with sulphuric acid a sulphonic acid, the salts of which gave with ferric chloride an intense blue colour like that produced by thymol sulphonates. The phenol of *oleum serpylli* resembles thymol, but differs in the following respects: (1) Its solution in diluted alcohol turns green with iron chloride, while thymol causes no noticeable coloration. (2) The phenol of *oleum serpylli* does not congeal at -10° C.; while thymol often remains liquid at a moderate temperature, but solidifies at 0° C. (3) The

potassium salt of the sulpho-acid is amorphous in the case of serpyllum, while that of thymol crystallizes easily.

The Preparation of Bismuth Subnitrate. A. Lalien. (*L'Union Pharmaceutique*, 1878, No. 8.) The process recommended by the author is said to give a purer and denser product and a larger yield than the methods usually employed. It does not involve the usual loss of bismuth in the form of an acid nitrate. The directions given are as follows :—200 grams of bismuth are dissolved in a sufficient quantity of nitric acid; the clear solution is decanted and poured into about 8 litres of water, containing 500 grams of solution of ammonia. The precipitate is washed, transferred to a capsule, and 50 to 60 grams of caustic soda, dissolved in a little water, are added to it. The capsule is then exposed for fifteen to twenty minutes to the heat of a water bath, and the contents stirred up several times. After having again become cold, the supernatant liquor is poured off, the precipitate thoroughly washed, and a quantity of nitric acid, representing 48·5 grams of anhydrous nitric acid (to be determined from the sp. gr., etc.), is added to it in small portions at a time, and under constant stirring. If, during this addition, the mass should become too thick, a little water may be added, but not enough to destroy the pasty consistence of the mass. The capsule is then replaced for a few minutes on the water bath, and the mass well stirred, until its yellowish colour has changed to a perfect white. It is then diluted with a little water, the precipitate collected on a filter placed on a muslin strainer, washed, drained, pressed, and dried. The product amounts to about 256 grams.

Bismuth Subnitrate. A. Riche. (*Chem. and Drugg.*, Sept., 1878.) The author draws attention to the fact that the preparations of bismuth contain recognisable quantities of lead, and it has been said that one sample of the subnitrate contained as much as 1 per cent. of the contamination. This result was obtained by treating a solution of the salt with sulphuric acid containing a little hydrochloric acid, as much alcohol as possible, and estimating the lead precipitate as lead sulphate. The author has analysed samples of the commercial article, and finds the proportion of this precipitate oscillates between ·580 and ·135 per cent., the average being ·273 per cent. If this consisted solely of sulphate of lead, it would correspond at the most with only ·4 per cent., or 4 parts in 1,000. But analysis proves it to be a very complex body. It contains sand, gelatinous silica, silicates, bismuth, silver, iron, and, in large quantities, calcium combined with sulphuric acid. The amount of lead actually contained in the precipitate varied from ·34

per cent. to nothing, and averaged .063 per cent., or 63 parts in 100,000. It can hardly be imagined that this quantity is sufficient to make this preparation a source of lead poison. To discover if it was possible to prepare pure subnitrate from bismuth contaminated with lead, 2 per cent. of the latter was added to a sample of bismuth. This was dissolved in nitric acid and divided into three parts. To No. 1 was added 40 or 50 times its bulk of common water; to No. 2 was added ammonia in quantity insufficient to neutralise it; No. 3 was treated with ammonia in excess. No. 1 gave, when treated with sulphuric acid, a very slight deposit, in which lead could not be detected; No. 2 contained about one-half per cent. of lead; and No. 3, 9 or 10 per cent. When experiment No. 1 was repeated with very hard water, the quantity of deposit and the percentage of lead were largely increased. It is the custom of manufacturers to precipitate the nitric acid solution by ammonia, with the view of increasing the yield of subnitrate. To decide on the most profitable method of proceeding, samples of subnitrate precipitated (1) by ordinary water, (2 and 3) by ammonia in small quantity and in excess, (4) by carbonate of soda, (5) by hard well water, and (6) several purchased in commerce were analysed to discover what percentage of nitric acid they contained. The acid is the cheapest constituent of the article. No. 1 contained 13.78 to 15.42 per cent. of NO_5 ; No. 2, 9.8 per cent.; No. 3, 2.9 to 0.60 per cent.; No. 4, 3.14 per cent.; No. 5, 2.12 to 1.47 per cent.; No. 6, 0.898 to 11.98; average of eight samples, 9.1 per cent. This clearly proves that a cheaper article can be produced by precipitating the subnitrate with ordinary soft water, while loss of bismuth may be prevented by precipitating it as an oxide from the mother-liquors. Experiments made to determine the yield of subnitrate and oxide of bismuth from given quantities of the metal gave the following results:—

Bismuth	50	100	200
Yielded Subnitrate	55	114	230
Oxide precipitated by Ammonia .	14	32	69

The practical conclusion is that the pharmacopœial process yields a purer product than any other, and that when the bismuth contained in the mother-liquor is preserved, it is also the most economical.

The Amount of Water of Crystallization in Zinc Acetate. N. Franchimont. (*Ber. der deutsch. chem.-Ges.*, xi., 11.) Contrary to the statements of numerous authors, the writer finds the amount

of water of crystallization in this salt to be not three but only two molecules, thus confirming an observation made by M. Dibbit. The salt parts with the whole of its water at 100°C . The anhydrous salt, when heated in a retort, fuses and gives off acetic acid, carbonic acid, and acetone, leaving in the retort plates of a pearly lustre, which were regarded by Voelkel as an acid salt, and by Larocque as sublimed anhydrous zinc acetate. The author agrees with the latter opinion, and states that the sublimed salt has the same melting point (242°C .) as the anhydrous salt before sublimation; and that, like the latter, it contains 35.7 per cent. of zinc.

Theobromine. Prof. Dragendorff. (*Archiv der Pharm.* cxxiii., 1.) Pure theobromine is soluble in 148.5 parts of boiling water, and in 1600 parts of water at 170°C .; in 422.5 parts of boiling alcohol, 4284 parts of alcohol (absolute) at 170°C ., and in 105 parts of boiling chloroform.

Theobromine may be obtained from the husk of cacao seeds by boiling repeatedly with water, concentrating the united decoctions by evaporation, precipitating with subacetate of lead, removing the excess of lead from the filtrate by sulphuric acid, then neutralizing with magnesium carbonate, boiling, evaporating to dryness with the addition of a slight excess of magnesia, and extracting the theobromine from the residue by boiling alcohol.

In order to ensure success with the murexide test, the author recommends that the solution of the alkaloid in chlorine water should be rapidly evaporated at a temperature not lower than 100°C ., and that the amount of chlorine water should not vary much.

The Composition and Analysis of Honey. Dr. J. Campbell Brown. (*Analyst*, 1878, 267.) The analytical determinations which are useful in the analysis of honey are given as follows:—

1. Estimation of the water of solution expelled at a temperature slightly above 100°C .
2. Water of combination and other volatile matter expelled only at a higher temperature; this may be sometimes safely estimated by difference.
3. Insoluble matter: pollen, wax, etc.
4. Microscopical examination of the honey, and especially of the pollen.
5. Estimation of the ash, if necessary.
6. Qualitative estimation of the ash when the quantity is great.
7. Estimation by the polariscope saccharimeter of the action of a solution of known strength on the polarised ray.
8. The same after inversion.

9. Estimation of the total glucose by standard solution of copper salt.

10. A similar estimation after inversion is often useful as a check.

The results of 7, 8, and 9 give, by calculation, the proportions of dextro- and lævo-glucose.

The proportion of cane sugar is calculated from 9 and 10, or may be deduced by means of Clerget's tables from 7 and 8.

The author has never been able to satisfy himself of the occurrence of cane sugar in honey, and is by no means sure that the figures representing cane sugar in the following analyses, and in those of Dr. Hassall, do not really represent experimental error. His figures for cane sugar are calculated from observed results, in which a very small observational error would give a difference of 1 or 2 per cent.

Results of Analyses of Authentic Specimens of Genuine Honey.

	English.	Welsh.	Normandy.	German.	Greek.	Lisbon.	Jamaica.	California.	Mexican.
Water expelled at 100°	19.1	16.4	15.5	19.11	19.8	18.8	19.46	17.9	18.47
Water expelled at a much higher temperature, and loss.	7.6	6.56	4.95	11.	7.8	6.66	7.58	8.13	10.03
Lævulose	36.6	37.2	36.88	33.14	40.	37.26	33.19	37.85	35.96
Dextrose.	36.55	39.7	42.5	36.58	32.2	34.94	35.21	36.01	35.47
Cane Sugar (?). . .	doubtful	none	none	none	none	1.2	2.2	none	doubtful
Wax, pollen, and insoluble matter . . .	good trace	trace	slight trace	trace	.05	1. nearly	2.1	good trace	trace
Mineral matter . . .	.15	.14	.17	.17	.15	.14	.26	.11	.07

The specific gravity of honey is about 1.41, but varies slightly with the proportion of water.

The proportions of water are higher than might have been expected; but the author has confirmed some of the above results by a combustion with oxide of copper.

The rotation of a polarised ray, produced by a solution of 16.26 grams crude honey in 100 c.c. of water is generally from -3.2° to -5° at 60° F. The only one of the above samples which gave a higher rotation was the Greek honey, which gave nearly $-5\frac{1}{2}^{\circ}$. The rotation produced by a solution of the same weight of dried

honey is generally not far from -4.8° ; but some latitude must be allowed until a larger number of observations have been made.

Test for Glucose and other Reducing Substances. E. Pollacci. (*Gaz. Chim. Ital.*, viii., 80-82. From *Journ. Chem. Soc.*) It is proposed to employ ferric oxide instead of cupric oxide, as a test for substances, such as glucose, which exert a reducing action. A minute quantity of a solution of pure ferric oxide is added to a little distilled water by means of a glass rod, then 3 or 4 drops of soda solution, and finally the liquid to be tested. The whole is boiled for a minute or two; sulphuric acid is added in quantity sufficient to dissolve the iron oxide, and then a drop of potassium ferricyanide solution; a blue precipitate is produced immediately if the liquid tested contained any reducing substance. In this way 1 part of glucose in 25,000 of water may be detected. Cane sugar does not produce this effect.

Reduction of Alkaline Copper Solutions by Saccharine Substances. F. Soxhlet. (*Chem. Centr.*, 1878, 218 and 236.) The author shows by numerous experiments that: (1) The supposition that 1 equivalent of grape or inverted sugar reduces 10 equivalents of copper oxide is false. (2) The reducing action of sugars on alkaline copper solutions cannot be expressed by an equivalent proportion, since the amount of copper oxide reduced varies with the strength of the copper solution. This proportion is found to vary from 1:8.5 to 1:12.5. (3) The results obtained with Fehling's solution by titration are purely empirical; they are very exact, being to ± 0.2 per cent., when made under the same conditions as to concentration. Undiluted Fehling's solution gives with 1 per cent. sugar solutions 0.5 per cent. higher results than with one-half per cent. solutions; fourfold diluted Fehling's solution gives the same results with both strengths of sugar solution. The results obtained with Fehling's solution, diluted with four volumes of water, differ by 3 per cent. from those obtained by Fehling (*Ann. d. Chem. u. Pharm.*, lxxii., 106), and confirmed by Neubauer (*Arch. der Pharm.* [2], lxxi., 278); the undiluted solution gives results differing by 4 per cent. as compared with the diluted one. (4) The gravimetric always gives higher numbers than the volumetric, unless care be taken that the copper solution employed be not more than from 0.5 to 1.0 per cent. in excess; hence, a gravimetric estimation of sugar by means of an alkaline copper solution is quite impossible. The author strongly criticises some apparently exact results obtained by experimenters using the gravimetric method. Considerable error may be introduced by heating Fehling's solution for some time, as

the undiluted solution cannot be heated for fifteen minutes without precipitating some suboxide of copper.

Milk sugar does not decompose the copper solution as quickly as grape sugar; so that it is necessary to heat somewhat longer, six to seven minutes is enough, otherwise it cannot be so well titrated as the other. But the estimation of milk sugar can be made more exact than in the case of grape or inverted sugar, as the former, either in a $\frac{1}{2}$ per cent. or a $1\frac{1}{2}$ per cent. solution, reduces the same amount of oxide in diluted and undiluted Fehling's solution. Six experiments gave the following results:—

1 gram of Milk Sugar reduces—

In $\frac{1}{2}$ per cent. solution, 147·8 c.c.; Fehling's solution
= 1·3023 gr. Cu = 7·39 equivalents.

In $1\frac{1}{2}$ per cent. solution, 147·9 c.c.; Fehling's solution
= 1·3031 gr. Cu = 7·39 equivalents.

In $1\frac{1}{2}$ per cent. solution, 148·0 c.c.; Fehling's solution
= 1·3040 gr. Cu = 7·40 equivalents.

The author always adds 50 c.c. of 1 per cent. sugar solution, or double that amount of the $\frac{1}{2}$ per cent. solution, to a measured volume of Fehling's solution previously mixed with an equal volume of Seignette salt solution, and heated to boiling. After boiling for from six to seven minutes in the case of milk sugar, and for three to four minutes in the case of grape or inverted sugar, the solution is filtered, and a portion is acidified with acetic acid, and tested for copper with potassium ferrocyanide. This process is repeated until the exact amount of copper solution is obtained.

By gravimetric analysis, 1:7·4 and 1:7·67 were the proportions of milk sugar to copper oxide obtained.

The behaviour of maltose and lactose to Sachsse's alkaline mercury-iodine solution has been examined, and Sachsse's results confirmed. Milk sugar and grape sugar behave relatively towards Sachsse's solution as they do towards Fehling's solution.

Supposed Compounds of Grape Sugar with Cupric Hydrate. W. Müller and J. Hagen. (*Pflüger's Archiv für Physiologie*, xvii., 568. From *Journ. Chem. Soc.*) Salkowski (*ibid.*, vi., 220) obtained a compound of grape sugar and cupric hydrate, containing 5 molecules of the latter to 1 molecule of the former body, by mixing solutions of grape sugar, cupric sulphate, and sodium hydrate in certain proportions; complete precipitation of the cupric hydrate and of the sugar was accomplished only when the proportion of sugar, cupric sulphate, and sodium hydrate was exactly as 1:5:10 molecules. The authors have repeated and modified Salkowski's

experiments. The solution of sugar (0.9 gram), cupric sulphate, and sodium hydrate were cooled and mixed in a vessel surrounded by ice; the precipitate contained the whole of the copper, and about 90 per cent. of the sugar originally employed. On washing repeatedly with ice-cold water, about 12 per cent. of sugar was removed from the precipitate. The proportion of cupric hydrate retained by 1 molecule of sugar varied in different experiments from 6.48 to 7.35 molecules. The authors believe that Salkowski obtained his results by working with diabetic urine; they themselves employed perfectly pure grape sugar.

The generally accepted rationale of Trommer's sugar test, viz., the production of a compound of 1 molecule of sugar and 5 molecules of cupric hydrate, and the subsequent solution of this compound in the excess of potash used, is regarded by the authors as incorrect. Analysis of the precipitate containing sugar and cupric hydrate showed that the composition of this substance varied considerably; hence it could not be a definite compound. On account of the partial decomposition of the sugar, even at very low temperatures, and in spite of special precautions, it was difficult to gain definite information with regard to the exact nature of this precipitate; but the facts, that after being washed until the washings ceased to contain sugar, the precipitate yielded sugar to water when suspended in the liquid, and that a mixture of 1 molecule of sugar with 30 molecules of cupric sulphate, and 60 molecules of sodium hydrate, yielded a precipitate, the filtrate from which yet contained sugar, prove, in the authors' opinion, that no definite chemical compound of grape sugar and cupric hydrate is produced in these experiments.

The authors have also attempted to prepare a compound of grape sugar and cupric oxide by dissolving cupric hydrate in a solution of sugar, but without success.

Hoppe-Seyler (*Handb. d. Physiol. u. Pathol. Chem. Anal.*, 1870, p. 198) asserts that a solution of grape sugar dissolves cupric hydrate, forming an unstable solution, from which cuprous oxide speedily separates, the sugar being oxidized to formic and other acids, and to a dextrine-like body. By careful and repeated experiments with cupric hydrate freshly precipitated, both dried in air and moist, the authors have assured themselves that this compound is altogether insoluble in a solution of pure grape sugar.

Fileti's (*Ber. der deutsch. chem.-Ges.*, viii., 441) copper glucosates are asserted by the authors to be really compounds containing sugar, cupric oxide, and potassium.

Compounds of Grape Sugar with Cupric Oxide and Potassium.
 W. Müller and J. Hagen. (*Ibid.*, 601.) Peculiarities in the phenomena exhibited in carrying out Trommer's sugar-test, as noted by Reichardt (*Annalen*, cxxvii., 299), induced the authors to study the behaviour of grape sugar towards cupric hydrate in alkaline liquids. Grape sugar and potassium hydrate solutions were mixed in definite proportions, and a measured amount of a solution of cupric sulphate was added, the whole being surrounded by ice. The following table represents the number of molecules of cupric hydrate dissolved by 1 molecule of grape sugar, in presence of a varying number of molecules of potassium hydrate :—

1 molecule of Grape Sugar in presence of—

- 1 molecule of Potassium Hydrate dissolves 1 to 1·5 molecules of Cupric Hydrate.
- 2·5 to 3 molecules of Potassium Hydrate dissolves 1·75 molecules of Cupric Hydrate.
- 4 molecules of Potassium Hydrate dissolves 2 molecules of Cupric Hydrate.
- 5 molecules of Potassium Hydrate dissolves 2·5 molecules of Cupric Hydrate.
- 6 to 10 molecules of Cupric Hydrate dissolves 2·75 molecules of Cupric Hydrate.

With a large excess of potassium hydrate 2·75 molecules of cupric hydrate only were dissolved. Inasmuch as 1 molecule of grape sugar is capable of reducing 5 molecules of cupric oxide in hot alkaline solution, it follows that this sugar can dissolve a much smaller amount of cupric oxide than it can reduce; it is not therefore necessary, in performing Trommer's sugar-test, to cease adding cupric sulphate when the precipitate is no longer re-dissolved.

By varying their experiments, viz., by mixing solutions of sugar and cupric sulphate, and then adding potassium hydrate, the authors found that, in presence of 8–10 molecules of the latter salt, 1 molecule of sugar was capable of dissolving 3 molecules of cupric hydrate; and of dissolving 3·5 molecules of the same hydrate when 13–33 molecules of potassium hydrate were present.

Pursuing the process used by Fileti in preparing the so-called copper glucosates (*Ber.*, viii., 441), the authors have obtained a substance which they regard as a compound of 1 molecule of sugar, 1 atom of copper, and 1 atom of potassium; and by using cupric acetate instead of sulphate, they have obtained a compound containing 2 atoms of copper, 1 atom of potassium, and 1 molecule of sugar. These substances are soluble in water. Experiments

have shown that no corresponding *insoluble* double salt exists, but that the permanent precipitate produced, by adding 4 to 5 molecules of cupric sulphate to 1 molecule of sugar, in a solution containing excess of alkali, consists only of cupric hydrate.

Volumetric Estimation of Sugar. F. W. Pavy. (*Chem. News*, xxxix., 77.) 120 c.c. of Fehling's solution are mixed with 300 c.c. strong ammonia, sp. gr. 880, and 580 c.c. water, and 20 c.c. of this blue liquid (= 0.01 gram sugar) are run into a flask fitted with a cork, through which passes the delivery tube of a burette and an exit tube, respectively. The burette is filled up with the saccharine liquid under examination; the contents of the flask are boiled, and the sugar solution is run in until the blue liquid is completely decolorized. The saccharine liquid should be somewhat dilute. The process depends on the fact that the cuprous oxide produced by the reducing action of the sugar is dissolved by the ammonia present as quickly as it is formed, and that if air be excluded, the resultant liquid is colourless. The test solution also has the advantage over Fehling's solution of remaining unchanged when kept.

The Action of Sugar of Milk on Fehling's Solution. H. Rodewald and B. Tollens. (*Ber. der deutsch. chem.-Ges.*, 1879, No. 17.) The authors point out that whilst chemists are agreed on the reductive power of dextrose, there is a great discrepancy concerning lactose, 1 molecule of which is considered to represent various quantities of copper oxide, ranging from $6\frac{1}{2}$ to 8 atoms. They find that the exact quantity required is 7.47 atoms of copper to 1 molecule of milk sugar, = 6.700 mgm. milk sugar to 1 c.c. Fehling's liquor. They recommend that this reagent should not be prepared in quantities beforehand; 60 grams of the best caustic soda and 173 grams of re-crystallized tartrate of sodium and potassium are dissolved in a half litre of water, whilst 34.639 grams pure copper sulphate are dissolved separately in another half litre. Equal volumes of these two liquids are mixed when wanted.

The Composition of Cows' Milk in Health and Disease. A. W. Blyth. (*Chem. News*, from a paper read before the Chemical Society, May 15, 1879.) The results of this research are the separation of two alkaloidal bodies as normal constituents of milk; the separation of a substance, probably a glucoside, derived from plants, etc., eaten by the cow; a quantitative estimation of the different constituents of milk; analyses of samples of milk derived from cattle in an unhealthy state. The separation of the milk alkaloids:—A litre of milk is divided into three equal parts, to one of which a litre of water is added, the casein is precipitated in a flocculent

condition by the cautious addition of acetic acid, and, finally, by passing carbonic acid, a clear yellow whey is obtained, which is separated by decantation and filtration, and used to precipitate the second portion; the whey from this is similarly used to precipitate the third portion of milk. The yellow whey is boiled and filtered to get rid of albumen, and to the filtrate an excess of the solution of nitrate of mercury used for urea estimation is added. The precipitate which falls contains the two alkaloids, any albumen, and urea as mercury compounds. It is washed and decomposed with sulphuretted hydrogen, etc. The first alkaloid, which the author proposes to call *galactine*, is thrown down by acetate of lead; the lead salt has the composition $(\text{Pb O})_{23} \text{C}_{54} \text{H}_{78} \text{N}_4 \text{O}_{45}$. Galactine is a white, brittle, neutral, tasteless, non-crystalline mass, soluble in water, insoluble in alcohol; it is precipitated by Sonnenschein's and Scheibler's reagents. Excess of lead used to precipitate the galactine is removed and nitrate of mercury added, which throws down an alkaloidal colouring matter. Latochrome, the empirical formula of the mercury salt $\text{Hg O C}_6 \text{H}_{18} \text{N O}_6$. Latochrome is a bright red-orange resinous body, softening at 100° , soluble in water and hot alcohol. In addition to these alkaloids the author has separated two substances, $\text{C H}_3 \text{O}_5$ and $\text{C}_3 \text{H}_3 \text{O}_4$, reducing copper solution, which he regards as decomposition products of one substance, and as derived from food eaten by the cow. They were obtained by precipitation with ammonia and tannin, after separating the above alkaloids. The author gives the following as the average composition of healthy cow's milk:—Milk fat, 3.50 per cent. (oleine, 1.477; stearin and palmitin, 1.75; butyrin, 0.270; caproin, caprylin, and rutin, 0.003); casein, 3.93; albumen, 0.77; milk sugar, 4.00; galactine, 0.17; latochrome, not determined; bitter principle, 0.01; urea, trace; ash, 0.70 ($\text{K}_2 \text{O}$, 0.1228; $\text{Na}_2 \text{O}$, 0.0868; Ca O , 0.1608; $\text{Fe}_2 \text{O}_3$, 0.0005; $\text{P}_2 \text{O}_5$, 0.1922; Cl , 0.1146; Mg O , 0.0243); water, 86.87. As regards milk from diseased cows, the author concludes that a cow suffering from even very acute disease may give milk differing in no essential feature from normal milk, whilst local affections of the udder may often be easily recognised. Analyses of milk from cows suffering from mammitis, pneumonia, phthisis, etc., are given.

A New and Rapid Process for the Analysis of Milk. A. Adam. (*Comptes Rendus*, lxxxvii., 290.) The analysis is performed by means of an apparatus consisting essentially of a glass tube of about 40 c.c. capacity, provided with a stopper at the top, expanded in the middle, and tapered off at the bottom, which is closed by a glass stopcock. Into this apparatus is introduced 10 c.c. of alcohol of

75°, containing $\frac{1}{100}$ of its volume of sodic hydrate; then 10 c.c. of milk, which must be neutral; and finally, 12 c.c. of pure ether. The liquids are shaken together, and allowed to remain at rest for five minutes, when they separate into two layers: the clear upper one contains all the butter; the lower, the lactose and casein. The butter contained in the former is estimated by evaporating and weighing, allowing 1 centigram for a little casein, etc., which may be contained in the liquid, or eliminating this by re-solution in ether. In the liquid first drawn off, the lactose and casein are estimated by making up to 100 c.c. with distilled water, and adding 10 drops of acetic acid; the casein then separates, and after having been removed by filtration, is pressed between folds of bibulous paper, dried, and weighed. The filtrate contains the salts of the milk, the acetate of sodium formed, and the lactose. The latter is estimated by means of Fehling's solution. All these operations are easily performed in an hour and a half; and if, at the commencement, 10 c.c. of the milk acidulated with two drops of acetic acid are set to evaporate, the weights of dry residue, ash, and water may be obtained within the same time.

A Method of Distinguishing Gallic, Tannic, and Pyrogallic Acids.
W. Watson. (*Pharm. Journ.*, ix., 46.) To about half a grain of each acid in a little water add NH_4HO :—

Gallic.	Tannic.	Pyrogallic.
Pink, rapidly changing to deep orange solution.	Same as Gallic.	Lemon coloured solution.

To each ammoniacal solution add HN O_3 :—

Gallic.	Tannic.	Pyrogallic.
Red.	Purple precipitate, insoluble in excess.	Red.

Substituting H Cl for H N O_3 :—

Gallic.	Tannic.	Pyrogallic.
Red.	Pink precipitate, soluble in excess.	Pink, quickly changing to red.

Lupinin, a New Glucoside. E. Schulze and J. Barbieri. (*Ber. der deutsch. chem.-Ges.*, xi., 2200.) The authors obtained this glucoside from *Lupinus luteus* by exhausting the dry plants with alcohol of 50 per cent., precipitating the tincture with solution of subacetate of lead, decomposing the precipitate with sulphuretted hydrogen, and afterwards treating it with a large quantity of hot water. On cooling, the lupinin separates out as a yellowish white crystalline mass. Its composition is represented by the formula $C_{29}H_{32}O_{16} + 7H_2O$. It is sparingly soluble in water and alcohol, but freely so in ammonia, with which it forms a yellow solution, darkening on exposure to the air, and giving a yellow precipitate with solution of lead acetate. Acids precipitate it from its ammoniacal solution in the form of very fine yellowish needles. When heated with dilute mineral acids, it splits up into dextrose and a yellow insoluble body, lupigenin, of the formula $C_{17}H_{12}O_6$.

Lupigenin is insoluble in water, sparingly soluble in alcohol, and readily soluble in strong sulphuric acid, with which it forms a yellow solution, changing to yellowish red on the addition of nitric acid, and to reddish brown on the addition of potassium bichromate. With ammonia it forms a deep yellow solution, from which it is reprecipitated by acids as a yellow flocculent mass. Upon evaporation over sulphuric acid the ammoniacal solution yields a lemon-yellow crystalline powder having the composition—



Action of Iodic Acid, Sulphomolybdic Acid, and Ferric Chloride on Morphia and various other Substances. D. Brown. (*Med. Times and Gazette*, July 20, 1878.)

Action of Iodic Acid and Starch on Morphia.—When $\frac{1}{2000}$ of a grain of muriate of morphia dissolved in a drop of water was moistened with a little starch paste, and a particle of iodic acid was added, a blue colour was instantly developed, which soon disappeared.

Action of Iodic Acid on Grape Juice.—The juice was simply squeezed from the fruit, and a few drops mixed with starch paste, a crystal of iodic acid being then added. No colour appeared even after three hours. A quantity of the same juice was evaporated to dryness at the ordinary temperature over sulphuric acid, and the residue likewise gave negative results. The dry alcoholic extract similarly treated gave at once a dirty blue colour, which gradually disappeared. With the ethereal extract prepared by Stas's process no coloration could be obtained.

Action of Iodic Acid on Orange Juice.—Orange juice, with iodic

acid and starch, gave a blue colour instantly. The dried juice behaved in the same way. No definite reaction could be obtained with the alcoholic extract, only a faint streak of violet generally appearing, which did not increase. The ethereal extract prepared by Stas's process had no effect on the iodic acid.

Action of Iodic Acid on Saliva.—Iodic acid and starch produce immediately with saliva a bright blue. This reaction takes place equally well with dried saliva. When the saliva has been mixed with acetate of lead, and the lead removed by sulphuretted hydrogen, the iodic acid reaction is much less distinct.

Action of Iodic Acid on Mixture of Orange Juice and Saliva.—A violet colour is immediately produced. This reaction resembles that of morphia, but there is in this case no alteration in the colour, the blue tint not being developed.

Action of "Sulphomolybdic Acid" on Morphia.—With a drop of the sulphomolybdic acid, $\frac{1}{2000}$ th of a grain of muriate of morphia gave immediately a rich purple colour, which rapidly disappeared, the liquid assuming a brown tint, which in turn passed into blue. This occupied fifteen minutes, and in half an hour the colour had altogether disappeared. The proportions of the reagents were varied, but the results did not materially differ. Free morphia deports itself in precisely the same way. The presence of water interferes with and may altogether prevent the reaction.

Action of "Sulphomolybdic Acid" on Grape Juice.—With no proportions could any coloration be obtained until the lapse of nearly half an hour, and the colour was very faint and quickly disappeared. In the case of dried juice the reaction was practically the same. The alcoholic extract gave varying results, but the shortest time in which any trace of blue appeared was five minutes, the colour taking about ten minutes to spread through the liquid, and being of an obscure, dirty shade. The yield of ethereal extract by Stas's process was extremely small. It gave an evanescent reddish tint with sulphomolybdic acid, which, however, did not develop into blue, except in one instance, when the colour appeared in a few minutes. It must here be noted, however, that in examining the product of Stas's process, there is no use in applying the molybdic test, unless special precautions have been taken to get rid of the alcohol, as the least traces of that fluid will reduce the molybdic acid, giving the same blue colour as if morphia were present.

Action of "Sulphomolybdic Acid" on Orange Juice.—No coloration was obtained with the fresh juice. When the dried juice was employed a faint blue made its appearance in from ten to fifteen

minutes. With the ethereal extract of orange (Stas's process) no blue colour was produced.

Action of "Sulphomolybdic Acid" on Saliva.—With the natural saliva no reaction was obtained, but when it was evaporated to dryness and mixed with the molybdic acid, a slight blue colour appeared after the mixture had stood more than thirty minutes.

Action of "Sulphomolybdic Acid" on a Mixture of Orange Juice and Saliva.—No blue colour was obtained until about half an hour, and it was not distinct. A mixture of saliva and orange juice was evaporated to dryness and tested in the same way, with the result that the blue tint made its appearance in about twenty minutes, but was not very decided until some time longer.

Action of Ferric Chloride on Morphia.—A blue or bluish green is produced, even with $\frac{1}{2000}$ th of a grain.

Action of Ferric Chloride on Meconic Acid.—The wine-red tint is perceptible with $\frac{1}{1200}$ th part of a grain, but that is about the limit of the reaction. The colour is very distinct with $\frac{1}{2000}$ th part of a grain.

Action of Ferric Chloride on Saliva.—A slight orange-red tint is produced both with the moist and dry saliva. This colour would not be mistaken for the wine-red of meconate of iron.

Action of Ferric Chloride on a Mixture of Orange Juice and Saliva.—Nothing but an orange colour could be obtained either with the moist or dry mixture.

Action of Ferric Chloride on Vinegar.—Samples of white, brown, and French vinegar were tested, but perchloride of iron, however applied, failed to produce a red coloration. The residue from the evaporation of the vinegars was likewise tested with negative results.

Besides the experiments which have been detailed, mixtures of orange and grape juices, and of orange juice, grape juice, and saliva, both in their natural state, and evaporated to dryness, were tested with the same reagents as were used in other cases; but the results were just such as might be anticipated from the foregoing experiments, and it would be superfluous to give them in an extended form. In every instance several experiments were tried, and that giving the most decided reaction is the one described.

Butter Analysis by Hehner's Method. W. Fleischmann and P. Vieth. (*Zeitschr. für analyt. Chem.*, 1878, 287.) In a long series of experiments the authors found that the amount of insoluble acids in genuine butter may vary from 85.7 to 89.7 per cent. Samples of butter containing between 87.5 and 89.7 per cent. of these acids may be either genuine or adulterated; so that in such

cases the method gives no reliable indications. Butter containing 87.5 per cent. or less of insoluble acids is regarded by the authors without suspicion.

Detection of the Presence of Iodine and Chlorine in Bromine. E. Biltz. (*Pharmaceut. Centralh.*, Sept. 19, 1878, 354.) The author dissolves the bromine in 40 times its bulk of water, shakes the solution with powdered metallic iron for some time, and, after allowing to settle and decanting the liquid, adds solution of starch and a few drops of the same bromine water, whereupon the presence of iodine will be immediately recognised by a blue coloration. The test for chlorine is the one suggested by Duflos, and consists in the treatment of the bromine with solution of ammonia, the digestion of this solution with barium carbonate, the evaporation of the filtered liquid to dryness, and the treatment of the strongly heated residue with absolute alcohol, which, if chlorine was present, will leave an insoluble residue of chloride of barium.

Ammoniated Citrates. E. Landrin. (*Pharmaceut. Centralh.*, 1878, No. 40.) Most metallic oxides and citrates are known to be soluble in ammonium citrate. The author proposed to ascertain whether the salt acts merely as a solvent or enters into a direct combination with the oxides.

On adding to a saturated solution of ammonium citrate some pulverulent lime, or freshly precipitated calcium carbonate, the calcium displaces the ammonium and combines with the citric acid. The liquid, which is turbid at first, becomes clear on heating. On cooling it deposits a copious white precipitate, which is found to be tribasic calcium citrate (tricalcic citrate); while the liquid contains ammonium citrate, and a small quantity of calcium citrate. On further concentrating, a fresh quantity of citrate separates, and the liquid finally contains nothing but ammonium citrate, which crystallizes out on evaporation. Calcium citrate, therefore, which is by itself insoluble in water, is soluble in ammonium citrate. Barium and strontium behave like calcium, and it was under no circumstances possible to obtain a double salt of ammonium and one of the above bases. Magnesium, however, acts differently. This base likewise displaces ammonium; but on cooling no precipitation occurs. If the solution be concentrated over sulphuric acid at ordinary temperature, small crystals are formed, which grow together into a thick crust. They have the composition—



This salt is soluble in water, very little in alcohol, and is not

bitter, as magnesium salts generally are. It may be regarded as diammonium citrate ($(\text{NH}_4)_2\text{H C}_6\text{H}_5\text{O}_7$), in which the hydrogen is replaced by magnesium: hence the author calls it diammonium-magnesium citrate. On treating a saturated solution of ammonium citrate with gelatinous alumina, a crystalline salt is obtained, which is a double salt of diammonium-aluminium citrate with ordinary ammonium citrate. Similarly freshly precipitated ferric oxide is soluble in ammonium citrate. Nickel, cobalt, manganese, and copper also form such compounds.

The Presence of Ozone in Vegetable Tissues. Dr. J. Jamieson. (*Pharm. Journ.*, 3rd series, ix., 308.) The author publishes some interesting observations which seem to point to the formation of ozone in the process of vegetable respiration. The points which he considers to have been established are these:—(1) That the oxygen, inhaled by plants as well as by animals, enters first into some form of loose combination, whereby it is ozonized, or rendered active; and (2) that plants contain a substance, other than chlorophyll, which has some important points of analogy with the hæmoglobin of animals, acting like it as an ozone transferrer. He thinks, however, that it cannot yet be regarded as more than fair presumption that this substance is that with which oxygen becomes loosely combined. The test employed by Dr. Jamieson is the deep blue colour produced in a mixture of tincture of guaiacum and peroxide of hydrogen by a minute trace of blood or hæmoglobin. The experiments were made chiefly on fruits of different sorts, especially apples and pears, though what is true of them holds good of most other fresh vegetable structures and expressed juices. If a drop of tincture of guaiacum be allowed to fall on a freshly cut surface of an apple or pear which has not been too long gathered and is not decayed, it will generally be found that a blue colour is quickly struck. Here we have the recognised reaction characteristic of the presence of ozone. The rapidity and intensity of the reaction will be found to vary with different articles, or different specimens of the same article; and they may fail altogether, as in very watery fruits, such as some grapes; though even with these the guaiacum reaction may be perceptible in a green berry from the same bunch. The reaction was not observed with soft pulpy fruits which decay quickly, such as the strawberry or peach. When fruits have been long kept, the ozone reaction becomes gradually weaker, the power of inhaling oxygen being lost, and the amount stored up gradually consumed. It may still be detected when the fruit has become over-ripe, and has entered on the stage of incipient decay, disappearing entirely

when actual rottenness sets in. When fruits, etc., are cooked, either with moist or dry heat, both this substance and the active oxygen are destroyed, no blue colour being produced by guaiacum alone, or on the addition of peroxide of hydrogen. Dr. Jamieson adduces reasons for concluding:—(1) That the agent which produces these reactions is not merely ordinary oxygen absorbed and dissolved in the vegetable juice; (2) that it is not newly-formed oxygen separated by the chlorophyll; (3) that it is not probable that it is actually dissolved ozone; and he considers the only remaining explanation to be that the oxygen is in the form of a loose combination, as it is in the blood, and therefore capable of being slowly given off in a very active form to combine definitely with oxidizable substances. Dr. Jamieson has come to no definite conclusion with regard to the substance with which the oxygen is temporarily combined; but he considers it certain that in fresh fruits and other vegetable substances there is an element which is possessed of the same ozone transferring property as hæmoglobin. It certainly is not chlorophyll, because it exists abundantly in the interior portions of fruits, and in many other structures, such as the potato, turnip, etc., which never contain chlorophyll. It is probably intimately associated with the vascular tissue, since the ozone reaction, as well as the ozone transferring function, is most marked and persistent in fruits near the core, where the vessels from the stalk are more abundant than in the outer and more purely cellular parts. In conclusion, he considers it possible that the substance is in some way attached to the small granules termed by Sachs aleurone-grains, which are, according to him, mainly proteinaceous; since the coloration sometimes appears most intense at the spots where these are abundant.

The Colouring Matter of Sandal and Caliatour Wood. N. Franchimont and Sieherer. (*Ber. der deutsch. chem.-Ges.*, xii., 14-17.) An amorphous substance having the composition $C_{17}H_{16}O_6$, is obtained by treating sandal wood with boiling alcohol and precipitating the concentrated extract with water. The crude product is converted into the lead salt, which, after washing with hot alcohol, is decomposed by dilute sulphuric acid. A better yield of this colouring matter is obtained from caliatour wood than from sandal wood. The pure substance melts at 104° – 105° , and is soluble in alcohol, acetic acid, alkaline carbonates, and in caustic alkalies. It is precipitated from alkaline solutions by the addition of hydrochloric acid.

On fusion with potash, resorcinol, acetic acid, and probably pyro-

catechol, and protocatechuic acid are formed. On oxidation with potassium permanganate, oxalic and acetic acids are obtained, as also a substance resembling vanillin in odour. Reducing agents appear to have no action on this colouring matter. By the action of hydrochloric acid at 180° it is decomposed into (1) methyl chloride, (2) a body soluble in hydrochloric acid, which crystallizes in colourless needles, and which forms a crystalline precipitate (m. p. 81°) with bromine water, (3) a substance soluble in alcohol, having the composition $C_8H_{10}O_5$, and (5) a black residue insoluble in alcohol, but soluble in caustic alkalies.

The Red Colouring Matter of *Lithospermum Erythrorhizon*. M. Kuhara. (*Pharm. Journ.* From a paper read before the Chemical Society, November 7, 1878.) The root of the above plant occurs in commerce in thick lumps; purple externally, but yellowish white inside. It was largely used for the manufacture of "Tokio purple," but from the fugitive character of the colour and the introduction of aniline dyes, its use has been almost abandoned. The root contains about 10 per cent. of glucose and 4 per cent. inverted sugar. The purple colouring matter is extracted almost completely by alcohol, and resembles, in some respects, anchusin, the colouring matter of alkanet; it is prepared from the root by extraction with alcohol, acidulating the extract with hydrochloric acid, and distilling off the alcohol. The impure colouring matter thus obtained was purified by precipitation with plumbic acetate, etc., in the usual way. It was finally obtained as a dark resinous uncrystallizable mass with a metallic green reflection; it is soluble in alcohol, ether, benzol, oil of turpentine, methylic alcohol, and carbon disulphide, but almost insoluble in water. It has a feebly acid reaction and a peculiar odour. It softens at $95^{\circ}C.$, and then partially volatilizes in red fumes, which condense on the colder part of the tube. The alcoholic solution has an absorption spectrum resembling that of alkanet; stannous chloride decolorizes the solution. It has the formula $C_{20}H_{30}O_{10}$. A barium salt was prepared and decomposed. The paper also contains an account of a bromine and a chlorine compound. Further experiments are in progress.

The Manufacture of Potassium Iodide. E. Schering. (*Chem. News*, xxxix., 118.) The author criticises the principal methods in actual use for the preparation of potassium iodide, viz. :—

1. Decomposition of barium iodide (obtained from barium sulphide and iodine) with potassium sulphate.
2. Introduction of iodine into caustic potassa; evaporation to dryness, and fusion with carbon in order to reduce iodate.

3. Decomposition of ferroso-ferric iodide with potassium carbonate.

Satisfactory results can be obtained by any of these methods, and the choice must be determined by local considerations.

In method No. 1 the preparation of a barium sulphide of high and regular strength is not unattended with nuisance, and the lixiviation of the barium sulphate requires much time. On the other hand, potassium sulphate can be obtained cheaper and purer than the corresponding carbonate, whilst the barium sulphate can be readily utilized for the reproduction of sulphide.

Method No. 2 obviates the necessity for washing a precipitate, and yields at once a very strong solution of potassium iodide; but the preparation of pure caustic potassa, and the concentration and subsequent fusion, are circumstantial and tedious. The author therefore prefers the third method, as ferroso-ferric iodide is easily prepared and the carbonate of iron is readily washed.

To obtain cubic crystals of a porcelain-like appearance, it is essential in the first method to ensure the complete decomposition of the barium sulphide by the iodine: if alkaline sulphides are mixed with the potassium iodide, the crystals are paltry. If the lye contains iron sulphide, which is soluble in hot and concentrated potassium iodide, the crystals take a blue appearance. An excess of iodine dissolves foreign metals present in the barium sulphide, and the crystals may then be discoloured.

In the case of the second method, irregularity in melting may produce iodic acid, and a caustic potassa not free from sulphates causes the presence in the lye of alkaline sulphide. Both these injurious impurities must be removed prior to crystallizing.

In the third method these annoyances are excluded. Salts of sodium must in all cases be avoided. Some manufacturers, to avoid the presence of sulphides, leave purposely a trace of iodate in the lye. The result is that the crystals turn yellow. The presence of lead in the iodide is exceedingly objectionable. This metal is soluble in concentrated potassium iodate, and cannot be precipitated by sulphuretted hydrogen except after great dilution.

If not removed lead affects not merely the colour but the form of the crystals:

No demonstrable trace of potassium carbonate is admissible either for medical or photographic purposes. Potassium iodide, therefore, should be unaffected by salts of barium. The perfect absence of chlorine can never be attained, as even the best sample of iodine, as well as of potassium carbonate, contain traces of this impurity.

The Chilian iodine, obtained from soda-saltpetre, is becoming a

formidable rival to the European product, which cannot be offered at a reduced figure, as the manufacturers have lost their market for potassium chloride in consequence of the rivalry of the Stassfurt mines. Chilian iodine is met with in commerce either as a paste or as copper iodide.

New Combinations of Hydrochloric Acid with Ammonia. L. Troost. (*Comptes Rendus*, 1879, No. 11.) The author remarks that hydrochloric acid and ammonia have hitherto been obtained only in the proportions which form sal-ammoniac, analogous to common salt. No hydrochlorate of this chloride has yet been discovered, nor an ammonic hydrochlorate with excess of base. He has discovered a great number of curious compounds formed by dry ammonia with hydrochloric acid, hydrosulphuric acid, and other acids, both mineral and organic. He takes ammoniacal gas absolutely dry and free from every trace of compound ammonias, saturates it with pure dry hydrochloric acid, and submits the sal-ammoniac thus obtained and distilled in a close vessel to the action of a large excess of gaseous ammonia, refrigerating to different degrees. He thus obtains two well-defined compounds, characterized by their point of fusion, their crystalline structure, and their tension of dissociation. The former of these, tetra-ammonic hydrochlorate, $\text{HCl}, 4\text{N H}_3$, melts at $+7^\circ$, and its crystals depolarise light powerfully. The other compound, hepta-ammonic hydrochlorate, $\text{HCl}, 7\text{N H}_3$, melts at -18° .

Liquid Camphor. M. Wreden. (*Chem. and Drugg.*, 1878, 446.) The author announces that he has converted ordinary camphor into a liquid isomer by the action of dilute hydrochloric acid at 190° . The new compound boils at 187° to 193° . Its sp. gr. equals 0.913, and it does not crystallize at a temperature of -17° .

The Action of Iodine upon Rhubarb. H. G. Greenish. (Abstracted from a paper read by the author before the Pharmaceutical Society, April 2, 1879, and recorded in the *Pharm. Journ.*, 3rd series, ix., 813.) The action which a solution of iodine exercises upon rhubarb in the form of either an unstrained decoction or a cold aqueous filtered infusion has been previously investigated by M. Husson, with a view of showing that practical use could be made of this action in the determination of the relative qualities of samples of rhubarb. (See *Union Pharmaceutique*, April, 1875). The conclusion arrived at by that author is the following:—

“The greater the quantity of iodine absorbed without a change of colour taking place in the decoction, the better is the quality of the rhubarb operated upon. On the other hand, the less iodine

required to produce a greenish tint, and leave a black residue, the worse will be the quality of the sample."

In order to check these conclusions, the author of the present paper carried out a series of experiments with eight different samples of rhubarb, the names and sources of which will be found in the original report in the *Pharmaceutical Journal*. Maceration with cold water was found to be preferable to boiling, as the former process completely extracts the whole of the active principles of the root without acting upon the starch. The experiments were conducted as follows:—

5 grams of the root were macerated twenty-four hours at the ordinary room temperature (15°C.), being frequently shaken during the day, and allowed to stand during the night; the fluid was then filtered. The filtrate amounted, in all cases but one, to 75 c.c. or more, and was employed as follows:—

1. 25 c.c. were titrated with iodine solution of the same strength as that employed by M. Husson (viz., 25 grams in a litre). The solution was delivered from a burette graduated to tenths of a cubic centimetre, but from which twentieths of a cubic centimetre could easily be read off. The end reaction was determined by taking out a drop on a glass rod, and bringing it into contact with a drop of starch paste placed on a porcelain plate. Owing to the thick yellow state of the liquid at this point a blue tint is not easily seen. Two points were therefore noted; that at which the starch paste assumed a green tint, and that at which the reaction was strongly blue.

2. 25 c.c. were evaporated on a water bath to the consistence of a thin syrup, mucilage and cathartic acid precipitated by 50 c.c. absolute alcohol, filtered; the alcohol removed from the filtrate by evaporation, the residue mixed with water and titrated. The titration in this and the following experiments was easier than that of the fluid itself.

3. The precipitated mucilage and cathartic acid were dissolved in water and titrated.

4. 25 c.c. were precipitated with solution of gelatine to remove tannin, the precipitate filtered off, washed, the filtrate evaporated to small bulk, freed from gelatine, mucilage, and cathartic acid by alcohol, again filtered, evaporated to remove alcohol, diluted with water, and titrated.

5. The residue of the root insoluble in cold water was washed with water, transferred to a porcelain dish and made up with water to 100 grams, boiled to one-half, cooled, and made up to 100 c.c.; 25 c.c. were then filtered off and titrated.

The results of the author's experiments were such as to justify the following conclusions:—(1) That the quantity of iodine a sample of rhubarb is capable of absorbing cannot be regarded as indicating its quality. (2) That the quantity absorbed does not depend for its absorption on the active ingredients alone.

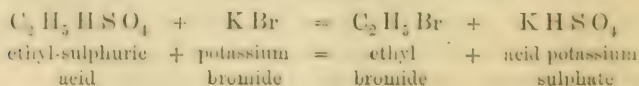
These results completely disprove M. Husson's conclusions.

The Preparation of Ethyl Bromide. W. H. Greene. (*Amer. Journ. of Pharm.*, June, 1879.) The process recommended by De Vrij, the action of a mixture of strong sulphuric acid and alcohol on potassium bromide, yields a product contaminated with ordinary ether, and as ethyl bromide and ether boil at 40° and 35° respectively, the ether cannot be removed. This contamination is avoided if the sulphuric acid be dilute, and the following process gives satisfactory results in the preparation not only of ethyl bromide, but of other alcoholic bromides:—

12 parts of coarsely powdered potassium bromide, and 11 parts of sulphuric acid, diluted with its volume of water, are heated in a retort or flask fitted to a condenser; as soon as hydrobromic acid begins to be disengaged, 12 parts of alcohol are allowed to flow in slowly, as in the preparation of ether. Ethyl bromide distils over with a small quantity of water and some alcohol. The distillate is agitated with water to remove alcohol, the ethyl bromide separated and dried by potassium carbonate, which at the same time neutralizes any free acid. It needs no further purification. About 8 parts of ethyl bromide should be obtained. It should be kept in the dark, like all other ethereal compounds containing chlorine, iodine, or bromine.

Hydrobromic Ether, or Ethyl Bromide. (From *New Remedies*.) Dr. de Vrij's method for preparing this ether has been taken exception to by various observers, because it was found to produce some by-products which could not readily be removed; but some recent improvements of the process appear to have removed almost, if not entirely, this objection. The process is particularly well suited to the manufacture on a large scale, while for small operations J. P. Remington's process (see *Year-Book of Pharmacy*, 1878, p. 115) is probably preferable.

Dr. de Vrij's depends upon the reaction of ethyl-sulphuric (or sulphovinic) acid upon bromide of sodium or potassium:—



The ethyl-sulphuric acid is prepared by adding to one volume of 95 per cent. alcohol, contained in a leaden vessel, an equal volume of sulphuric acid (sp. gr. 1.830), in a constant gentle stream, and under continuous stirring. The quicker the mixture is made—avoiding, however, accidents from over-heating, etc.—the larger will be the yield of ethyl-sulphuric acid. After standing for some time, the mixture is diluted with one-fifth to one-fourth of its weight of water. The addition of the latter is necessary to obtain ample yield; otherwise a large quantity of ether and free hydrobromic acid will afterwards be found in the distillate. The operation of preparing the ether may be conducted as follows:—

Into a boiler of about thirty-four inches height and thirty-six inches diameter, lined with lead, and either set in brickwork or provided with a steam-chamber, 100 pounds of potassium bromide are introduced; a leaden lid, containing two tubulures, is hermetically fastened upon it, and a mixture prepared as above directed, from 100 pounds of 95 per cent. alcohol and 200 pounds of sulphuric acid (about equal volumes), diluted with 30 pounds of water, is poured through one of the tubulures, which is then closed with a rubber stopper, carrying a long thermometer. From the other tubulure arises a leaden delivery-tube, which passes through a *well-cooled* condenser. If the boiler be heated by a fire, the fire-hearth had better be constructed on the outside of the building containing the apparatus and condenser. If steam is used, it must have a tension of at least seventy-five pounds, as the temperature towards the end of the operation must be raised to, and kept for some time at, 130°C. ($= 266^{\circ}\text{F.}$). The reaction begins already at 90°C. ($= 194^{\circ}\text{F.}$); towards the end it requires a temperature of $125^{\circ}\text{--}130^{\circ}\text{C.}$ ($= 257^{\circ}\text{--}266^{\circ}\text{F.}$). It is remarkable that bromide of sodium requires 10 degrees more of heat than bromide of potassium before the reaction begins.

The resulting distillate is caught in stone jars, which are completely filled with cold water; the hydrobromic ether sinks to the bottom, and displaces a corresponding amount of water over the rim into the tub in which the jar is placed. These jars are frequently changed, care being taken to have as high a layer of water on the ether as possible, because the contaminating by-products of alcohol, ether, and free acid, are thereby washed out. In proportion as these are removed, the solubility of the hydrobromic ether in water diminishes until it becomes insignificant.

This process, carefully worked, will yield in practice very nearly the theoretical quantity of hydrobromic ether of 1.300 to 1.350 sp. gr., and of satisfactory purity.

Alcoholic Fermentation. P. Schützenberger and A. Destrem. (*Comptes Rendus*, 88, 593. From *Journ. Chem. Soc.*) This paper is a continuation of the researches described in *Comptes Rendus* 88, p. 287. 100 grams of fresh *unwashed* yeast, containing 1.0 gram of nitrogen as insoluble albuminoids, contained only 1.1 gram of nitrogen after decomposing 200 grams of sugar; whilst after maceration in water only, under the same conditions, there remained 1.5 gram of nitrogen. The total weight of the insoluble part of the yeast diminished less than by maceration only; and in experiments with small quantities of yeast, even increased, as in Pasteur's experiments.

Washed yeast, even in the absence of air, also decomposes sugar rapidly enough, 100 grams of yeast causing 200 grams of sugar to disappear in twenty-four hours. But the weight of insoluble residue diminishes about 40 per cent., and very much more than by simple maceration.

100 grams of fresh *washed* yeast, containing 19–20 grams insoluble matter, furnished only 11.8–13.2 grams after decomposing 200 grams of sugar; whilst after simple digestion with water it still furnished 15.8–16 grams.

The loss is due to the transformation of albuminoid matter into soluble amidated compounds. The 19 grams of original insoluble yeast contained 1.9 gram nitrogen; the 11.8 grams left after fermentation contained only 0.57 gram of nitrogen: 1.33 gram of nitrogen = 8.3 grams albuminoid matter, and $19.0 - 8.3 = 11.7$, the weight of the residual yeast. Another experiment cited gives a similar result.

100 grams of fresh washed yeast, corresponding with 18.4 grams of insoluble matter containing 1.895 gram of nitrogen, gave, after simple digestion, 15.84 grams insoluble residue containing 1.71 gram nitrogen. The loss in nitrogen is 0.185 gram, equivalent to 1.1 gram albuminoid matter. The total loss is 2.6 grams; $2.6 - 1.1 = 1.5$ gram non-nitrogenous matter eliminated by secondary fermentation.

100 grams of fresh washed yeast, by fermentation with access of air, lost only 3.2 grams proteid matter, and fixed 4.84 grams non-nitrogenous matter, the weight of insoluble residue increasing from 18.4 grams to 20.04 grams.

Conclusions.—(1) Yeast, placed under conditions which prevent its multiplication and development, nevertheless retains the power of decomposing sugar; and in so doing it loses more nitrogen than when simply digested with water deprived of sugar and oxygen.

The proportion between the quantity of sugar decomposed and the new yeast formed, *i.e.*, the fermenting power, thus becomes a *negative* quantity. (2) The proximate composition of yeast, or the proportion between its albuminoid and non-nitrogenous constituents, varies with the composition of the medium in which it lives.

The authors have previously recognised the formation of *aldehyde* in fermentation conducted without the presence of air. The aldehyde found in wine, etc., is therefore not due solely to oxidation of the alcohol. Its formation is directly connected with the decomposition of sugar, and may perhaps accompany the production of 6 molecules of glycerin to 1 of succinic acid, the sum of which ($= C_{22}H_{54}O_{22}$) contains more hydrogen than the original sugar.

Observations on M. Pasteur's Paper on Alcoholic Fermentation. M. Berthelot. (*Comptes Rendus*, Dec. 16, 1878. From *Chem. News*.) The author, feeling himself reflected upon by M. Pasteur's remarks on the posthumous essays of Claude Bernard, has undertaken a novel and interesting experiment. He writes, "When speaking of a soluble alcoholic ferment capable of being consumed step by step with its production, and in the very chemical act which it determines, I took care to add that, for the demonstration of this hypothesis, it would be necessary to discover the conditions in which this ferment is produced in more considerable proportions than the quantity destroyed in fermentation. Such were the conditions which C. Bernard seems to have met with in the experiments, the account of which has unfortunately reached us in so imperfect a manner. Nevertheless, I considered it useful to science to publish them, such as they are, with the object, not of opening a controversy, but of pointing out a new path for research." By simultaneously hydrogenizing and oxidizing sugar, the author has, in fact, succeeded in producing alcohol, though in very small proportions. He considers that his present results do not warrant a definite conclusion, for the limit may be due as much to the inaccuracy of the fundamental hypothesis as to the imperfection of the conditions. Still, he considers the fact that alcohol has been produced in the cold by the electrolysis of a solution of sugar merits to be placed on record.

Further Note on Hypophosphoric Acid and its Salts. T. Salzer. (*Liebig's Annalen*, xciv. 1). Concerning the preparation of the acid, the author remarks that only about one-fifteenth of the phosphorus employed is converted into hypophosphoric acid, the bulk passing on to the state of phosphoric acid. He then gives a detailed account of the combinations of hypophosphoric acid with sodium, potassium,

ammonium, barium, and calcium. He adds that, as there seems to exist only one combination of hypophosphoric acid and calcium, it will be possible to titrate neutral solutions of calcium with neutral hypophosphate of sodium, using reddened tincture of litmus as an indicator, since an alkaline reaction must appear when the precipitation is complete. The process may be extended to the salts of lead and other metals.

The Fermentative Action of the Juice of the Fruit of *Carica Papaya*. M. Wittmack. (*Pharm. Journ.*, 3rd series, ix., 449.) At a recent meeting of the Berlin Natural History Society, the author gave an account of some researches and experiments he had undertaken upon this subject.

A perfectly ripe, undamaged papaw fruit measures from seven to eight inches in length and three to four inches in width, and has the appearance of a rather long lemon; it has a beautiful yellow rind, which in its taste also resembles the lemon, though with a slight flavour of turpentine. The most interesting and important property attributed to it, however, is the power of its juice to rapidly render hard flesh tender.

As far back as the year 1750, Griffith Hughes says, in his "History of Barbadoes," "This juice is of so penetrating a nature, that if the unripe peeled fruit be boiled with the toughest old salted meat, it quickly makes it soft and tender; and if pigs be fed with the fruit, especially unripe, the thin mucous matter which coats the inside of the intestines is attacked, and if the food be not changed is completely destroyed." According to Browne, meat becomes tender after being washed with water to which the juice of *C. papaya* has been added, and if left in such water ten minutes it will fall from the spit while roasting, or separate into shreds while boiling. According to Holden the flesh of an animal hung to a branch of the tree is rendered tender. Karsten says that in Quito the use of carica juice when boiling meat is very general, but in Venezuela and Costa Rica the practice is unknown. Some further experiments were made by Roy, who obtained by making incisions in a single fruit 28.39 c.c. of the milky juice, which after evaporating to dryness, and again diluting with water, had a powerful action upon flesh, albumen, and gluten, while starch remained unaltered by it.

The author obtained after repeated incisions of a half ripe fruit only 1.195 gram of white milky juice, of the consistence of cream. This dried in a watch glass to a hard vitreous white mass, having what really appeared to be greasy spots on the surface, but what really were flocks of gelatinous substance that always adheres to

the more hardened material. The odour and flavour of the fresh juice recalled that of petroleum or of vulcanized india-rubber. The microscope showed it to be a fine grumous mass containing some larger particles and isolated starch grains. Iodine coloured the juice yellowish brown

A portion of the juice was dissolved in three times its weight of water, and this was placed with 10 grams of quite fresh lean beef in one piece in distilled water, and boiled for five minutes. Below the boiling point the meat fell into several pieces, and at the close of the experiment it had separated into coarse shreds. In the check experiments made without the juice, the boiled meat was visibly harder. Hard boiled albumen, digested with a little juice at a temperature of 20°C ., after twenty-four hours could be easily broken up with a glass rod. 50 grams of beef in one piece, enveloped in a leaf of *C. papaya* during twenty-four hours at 15°C ., after a short boiling became perfectly tender; a similar piece wrapped in paper and heated in the same manner remained quite hard. Some comparative experiments were also made with pepsin, and the following are the conclusions arrived at by the author:—

1. The milky juice of the *Carica papaya* is (or contains) a ferment which has an extraordinarily energetic action upon nitrogenous substances, and like pepsine curdles milk.

2. This juice differs from pepsine in being active without the addition of free acid,—probably it contains a small quantity; and further, it operates at a higher temperature (about 60° to 65°C .) and in a shorter time (five minutes at most).

3. The filtered juice differs chemically from pepsine in that it gives no precipitate on boiling, and further that it is precipitated by mercuric chloride, iodine, and all the mineral acids.

4. It resembles pepsine in being precipitated by neutral acetate of lead, and not giving a precipitate with sulphate of copper and perchloride of iron.

Detection of Carbolic Acid in the Urine in Poisoning Cases. Dr. Vulpius. (*Pharm. Zeitung*, March, 5, 1879.) After the administration of poisonous doses of carbolic acid, the urine ceases for the time to contain sulphates, owing to their conversion into sulphocarbulates. Such urine, when strongly acidified with nitric acid, fails to give the usual precipitate with barium chloride. The author regards this as a ready means of recognising the presence of carbolic acid in the system.

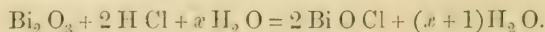
Detection of Bile Pigments in Urine. R. Uitymann. (*Zeitschr. für analyt. Chem.*, 1878, 523.) The author mixes 10 c.c. of the

urine with 3-4 c.c. of a solution of 1 part of caustic potash in 3 parts of water, and then acidulates with pure hydrochloric acid. In the presence of bile pigments the mixture is said to assume a fine emerald-green colour.

Colouring Effect of Rhubarb and Santonin on the Urine of Patients. J. Munk. (*Centralbl. f. d. med. Wissensch.*, 1878, 411.) The urine of persons taking rhubarb or santonin has a greenish colour, which changes to red on the addition of alkalies. To which of these two substances the coloration is due may be determined in the following manner:—

The change to red on the addition of alkaline carbonates occurs immediately if the coloration be due to rhubarb; if due to santonin, slowly and gradually. The red colour, if caused by rhubarb, is persistent; while that caused by santonin disappears within twenty-four to forty-eight hours. The red colour resulting from the action of alkalies on the colouring matter of rhubarb disappears under the influence of zinc dust; that due to santonin does not. In the case of rhubarb, the red colour is precipitated by an excess of baryta or lime water, so that the filtrate is colourless; whereas, in the case of santonin, the red colouring matter remains in solution, and the precipitate is white.

The Action of Aqueous Hydrochloric Acid upon Oxide of Bismuth. M. M. P. Muir. (*Chem. News*, xxxix., 183.) When oxide of bismuth is added to aqueous hydrochloric acid the oxide is dissolved, but a point is soon reached after which the bismuth in solution is precipitated as bismuthyl chloride (Bi O Cl), while the oxide added is simultaneously transformed into the same salt. Finally the whole of the bismuth is present in the form of insoluble bismuthyl chloride. The action of aqueous hydrochloric acid upon bismuthous oxide, so far as the initial and final distributions of mass are concerned, may be thus formulated,—



The presence of water renders possible an action between H Cl and Bi_2O_3 , which action would not occur in its absence.

Decomposition of Calcium Chloride by Water. H. C. Dibbitts. (*Arch. Neerland. des Sciences*, xiii. From *Chem. News*.) Crystalline calcium chloride ($\text{Ca Cl}_2 + 6\text{H}_2\text{O}$) loses in dry air, even below 10° , five molecules of water, the first four of which escape readily, and the last much more slowly. At 80° the salt becomes completely anhydrous in dry air. When the salt loses its crystalline water at a temperature not exceeding 130° , no appreciable loss of hydrochloric

acid takes place. Between 130° and 140° the escape of acid becomes perceptible. The more the temperature rises, the more hydrochloric acid escapes; still, even if gently heated over a naked flame, the decomposition is so slight that not more than 0.03 per cent. of the acid is lost. Even at 150° the loss is so slight that it remains entirely within the ordinary limit of error.

Purification of Strychnine. A. B. Prescott. (*New Remedies*, January, 1879, 11.) The usual mode of freeing strychnine from brucine, by means of diluted alcohol involves a loss of appreciable quantities of the former alkaloid. To obviate this the author proposes the use of a much weaker spirit than the one generally employed. He finds that of a diluted alcohol of 0.970 sp. gr., 2617 parts would be required to dissolve 1 part of strychnine, while 37.3 parts are sufficient for the complete solution of 1 part of brucine. To apply this fact in the separation of the two alkaloids, a known amount of pure brucine was mixed with an equal weight of strychnine, 50 parts of alcohol (sp. gr. .970) added, the mixture agitated, allowed to stand one hour, filtered, and the filter washed with as much more of the alcohol. The alcoholic solution, after evaporation, gave only a slight indication of strychnine. The strychnine remaining on the filter gave no reaction for brucine.

Ten samples of commercial strychnine were treated in this way with alcohol sp. gr. .970. All but two contained brucine.

Table Showing the Results.

Sample.	Amount taken in grams.	Residue after washing with Alcohol, sp. gr. .970.	Weight of the residue after evaporating the Alcohol.	Per cent. of Alkaloid dis- solved by Alco- hol sp. gr. .970.	Test for Brucia.
No. 1.	.125	.120	.004	3.2	Distinct.
" 2.	.1415	.140	.0005	.36	Slight.
" 3.	.1545	.152	.001	.64	Distinct.
" 4.	.121	.120	.0005	.4	Very slight.
" 5.	.150	.1485	.001	.66	Slight.
" 6.	.150	.148	.0015	1.00	Distinct.
" 7.	.170	.169	.0005	.29	No test.
" 8.	.120	.115	.004	3.33	Distinct.
" 9.	.130	.1285	.001	.76	Slight.
" 10.	.140	.139	—	—	No test.

Effect of Low Temperatures on Ferric Hydrate. E. B. Shuttleworth. (*Canad. Pharm. Journ.*, August, 1878.) A freshly made quantity of ferric hydrate was exposed to a cold of about 10° below zero from Saturday to Monday. When the frozen cake was thawed

out, the ferric hydrate had become granular, looked like fine-grain gunpowder, was readily soluble in nitric and hydrochloric acids, but very sparingly in acetic and citric acids. When *Dialyzed Iron* is subjected to a cold sufficient to produce complete congelation, the frozen mass, on thawing, deposits all the oxide in reddish brown shining scales. The clear, colourless supernatant liquid tastes decidedly more ferruginous than did the original solution, and with nitrate of silver gives a slight cloudiness.

Limit of Separation of Alcohol and Water by Distillation. J. A. le Bel. (*Comptes Rendus*, May 5, 1879. From *Chem. News*.) The greatest degree of concentration obtained by repeated rectifications was 96.5 per cent. On rectification over quicklime an alcohol was produced. When this spirit was submitted to fractional distillation, water passed over first, and a still stronger alcohol remained. After three rectifications the first portions marked 97.4 and the residue 99.3. The author finds that amylic alcohol from wines has not the repulsive odour of fousel oil or the crude amyliated alcohols of (beetroot) treacle. This odour, and possibly the injurious physiological action of the higher alcohols, may possibly, he considers, be due to the presence of certain empyreumatic compounds.

The Alkaloid of Pituri. A. Petit. (*Pharm. Journ.*, 3rd series, ix., 319.) Last year Mr. Gerrard succeeded in establishing the presence in pituri of an alkaloid, to which he gave the name piturine (see *Year-Book of Pharmacy*, 1878). The quantity of the drug at Mr. Gerrard's disposal was, however, so small as to preclude the possibility of anything like a close study of the properties of the principles named. The author, having received from Dr. Bancroft a large supply of pituri, has been able to take up and complete the experiments of Mr. Gerrard. The alkaloid he isolated was an almost colourless liquid, possessing powerful alkaline properties, and presenting all the reactions of the better defined alkaloids. It gave off an irritating odour, especially when heated slightly; and was very pungent to the tongue. Upon bringing strong hydrochloric acid close to the surface of the liquid dense fumes were formed. Placed in a watch glass upon a water bath it volatilized rapidly. It was, therefore, a *volatile alkaloid*.

The properties above described raised the inquiry whether the alkaloid was not nicotine. Some pure nicotine was therefore procured, and various comparative experiments have been made with the two substances.

The boiling point of the new alkaloid could not be determined owing to the quantity being insufficient.

Rotatory Power.—0.236 gram dissolved in 10 c.c. of 95° alcohol, gave with the polarimeter 5.85° , with a column of 20 centimetres, being for the yellow light a rotatory power of -123.9° , whilst the rotatory power of nicotine is, according to Buignet, -121.9° . When saturated with sulphuric acid the rotatory power of pituri passes to the right, as in the case of nicotine.

Alkalimetric Power.—2 c.c. of the preceding solution were saturated with titrated sulphuric acid. The results calculated to 10 c.c. gave: 1st experiment, 0.07 gram H_2SO_4 ; 2nd experiment, 0.0725 gram H_2SO_4 . These figures calculated as for nicotine gave 0.2312 gram and 0.2396 gram, or a mean of 0.2359 gram, a figure practically equal to the amount of alkaloid employed.

Chloroplatinate.—Dissolved in water and saturated with hydrochloric acid in slight excess, the alkaloid of pituri gave upon addition of chloride of platinum exactly the same crystals as those of the chloro-platinate of nicotine; that is to say, in dilute solution, flattened prisms with parallelogram base. This chloroplatinate, which is represented by the formula $\text{C}_{10}\text{H}_{14}\text{N}_2 \cdot 2\text{HClPtCl}_2$, having been dried at 115°C . during four hours, gave upon analysis,—platinum, 34 per cent.; chlorine, 36 per cent. The calculated numbers for chloroplatinate of nicotine are,—platinum, 34.4 per cent.; chlorine, 37 per cent.

The other reactions were absolutely the same as for nicotine. The author draws attention particularly to that relative to the formation of iodo-nicotine. Upon mixing together ethereal solutions of iodine and of the pituri alkaloid, very fine crystals similar to those of iodo-nicotine are rapidly formed.

The alkaloid prepared by Mr. Gerrard has been experimented with in London by two able physiologists, Messrs. Sidney Ringer and Murrell. The phenomena observed confirmed in an evident manner those described by Claude Bernard in his memoir on nicotine (*Leçons sur les Substances toxiques et médicamenteuses*); augmentation of the number of the respirations, which became painful and diaphragmatic, an unsteady gait, convulsive contraction of the muscles, rigidity of the limbs, are all there described. A remarkable circumstance is mentioned by all three observers: the animal appears blind, and the eyeball seems to be reversed, so that the pupil cannot be seen. But on examining this phenomenon more closely, Claude Bernard had observed, before Ringer and Murrell, that it was due to tension.

The alkaloid of pituri is therefore nicotine.

Complete Separation of Albumen from Animal Fluids. Dr. F.

Hofmeister. (*Chem. Centrall.*, 1878, 635.) It is well known that the coagulation of albumen by boiling does not effect a complete removal of this substance. For the purpose of its complete separation the author recommends the following process:—

The bulk of the albumen having been removed by the ordinary process of boiling, the filtrate is mixed with lead hydrate, boiled, and again filtered. The lead is removed from the filtrate by sulphuretted hydrogen, and the excess of the latter by boiling. The residual liquid is then absolutely free from albumen.

Should the original liquid contain appreciable quantities of sulphates or phosphates, it becomes necessary to add a few drops of solution of lead acetate before boiling with the hydrate.

Determination of Specific Gravities. E. F. Peckham. (*Chem. News*, xxxix., 97.) The following method for the determination of specific gravities of liquids was found to yield successful results when the quantity of liquid was only 3 c.c. A cube of aluminium, about 1 c.c. in bulk, suspended by a fine platinum wire, of known weight, is weighed first in the air, then just immersed in water, and finally in the liquid the specific gravity of which is to be ascertained. The difference between the weight in air and the weight in water gives the weight of water displaced by the cube; and the weight of an equal bulk of oil is ascertained in a similar way. The quotient of the weight of the oil by the weight of water gives the specific gravity. This method admits of perfect control over volume and temperature, and of rapid execution. For non-corrosive liquids, aluminium is preferable to platinum, on account of its low specific gravity.

A New Reaction of Creatinine. O. Maschke. (*Zeitschr. für analyt. Chem.*, 1878, 134.) On the addition of an excess of soda, potassium-sodium tartrate, and copper sulphate to a dilute solution of creatinine, a cloudiness is produced, which, after a short time, settles as a white precipitate. This reaction is hastened by heating the solution 50°–60°; if, however, the solution be boiled, gradual decomposition ensues. This reaction is sufficient to detect 0.01 gram in 100 c.c. of solution, but the precipitate, which is a compound of creatinine with cuprous oxide, is formed at the cost of some of the creatine present; so that it is advisable to add grape sugar, which reduces the copper salt in place of the creatinine. The precipitate is soluble in water and in ammonia, the solution becoming blue on exposure to the air. From the copper salt the compound of creatinine with zinc chloride may be formed.

Very small quantities of sugar may be detected in urine, by

precipitating the uric acid with an alkaline copper solution, then adding Rochelle salt and a little sulphate of copper, filtering, and allowing the clear liquid to flow from a pipette on to the surface of a boiling-hot solution of soda. A clear, yellowish brown ring, which gradually becomes cloudy, is formed at the line of contact of the two solutions. This appears to be due to the united actions of sugar, urochrome, and creatinine present, producing a double compound of creatinine and cuprous oxide with urochrome and cuprous oxide. Indican does not appear to be capable of forming a brown ring, but rather to hinder the precipitation of cupric and cuprous oxides. On the contrary, creatine gives no precipitate when treated as above.

Constituents of the Oil of Anthemis Nobilis. J. Köbig. (*Liebigs Annalen*, excv., 92-108. From *Journ. Chem. Soc.*, June, 1879.) The author submitted the oil to very careful fractional distillation, whereby he succeeded in separating it into five distinct portions, boiling at the following temperatures:—(1), 147°-148°; (2), 177°-177·5°; (3), 200°-201°; (4), 204°-205°; (5), above 220°, with decomposition. Each of these portions was analysed and saponified with aqueous potash, and the products of saponification were examined. The first portion was found to consist mainly of an ethereal salt of isobutyric acid, most probably ethyl isobutyrate. The second portion consisted of the isobutyl salt of angelic acid, $C_5H_7O.O.C_4H_9$. The third and fourth portions were found to be the amyl salts of angelic and tiglic acids, angelic acid predominating in the former portion and tiglic in the latter. The fifth portion yielded by saponification angelic and tiglic acids and the two following bodies:—(a) A hexyl alcohol of sp. gr. 0·8295 at 15°, boiling at 152°-153°, insoluble in water, and yielding a capronic acid by oxidation. This is believed by the author to be one of the eight theoretically possible primary hexyl alcohols, of which normal hexyl alcohol is the only one previously known. (b) A thick colourless liquid boiling at 213·5°-214·5°, of a peculiar camphor-like odour, isomeric with ordinary camphor, and termed *anthemol* by the author. This body was found to be the hydroxyl-derivative of terpene. It exists in chamomile oil as an ethereal salt of angelic and tiglic acids. It reacts with acetic anhydride to form an ethereal salt, $C_{10}H_{15}O.C_2H_3O$, from which it is recovered unaltered by saponification.

According to these results, Roman chamomile oil consists of a mixture of isobutyl isobutyrate, isobutyl angelate, amyl angelate and tiglate, and the angelic and tiglic ethers of a new hexyl-alcohol and

of terpene-alcohol (anthemol). Other substances, if present at all, can only exist in very small quantities.

Acids Obtained by the Saponification of Oil of Chamomile (*Anthemis Nobilis*). H. Kopp. (*Ibid.*, excv., 81-92.) The author saponified the oil by boiling it with alcoholic potash. After distilling off the alcohol the soap was boiled, first with water and then with dilute sulphuric acid, until nothing but water passed over. The distillate was neutralized with sodium carbonate, and evaporated to dryness, and the residue decomposed by sulphuric acid. The oily mixture of acids thereby set free was finally submitted to fractional distillation. In this way the author found angelic and tiglic acids in about equal quantities, isobutyric acid in much smaller amount, and a fourth acid, most probably methacrylic acid, but this was not isolated. No other acid was present in appreciable quantity.

Angelic acid, $C_5H_8O_2$, melts at $45^\circ-45.5^\circ$, and boils at 185° (not at 191° , as formerly stated). Its *calcium salt*, $(C_5H_7O_2)_2Ca + 2H_2O$, is much more freely soluble in cold than in hot water. On heating a cold saturated solution, the salt crystallizes in long brilliant needles, which disappear as the liquid cools. The *barium salt*, $(C_5H_7O_2)_2Ba + 4\frac{1}{2}H_2O$, is very freely soluble in water, and crystallizes with difficulty. The *silver salt*, $C_5H_7O_2Ag$, is a white precipitate, which crystallizes from boiling water in colourless feathery crystals. The *potassium salt* is crystalline, very soluble, and deliquescent.

Tiglic acid, $C_5H_8O_2$, melts at 64.5° , and boils at 198.5° . The *calcium salt* $(C_5H_7O_2)_2Ca + 3H_2O$, crystallizes in white laminae, which dissolve sparingly in cold and freely in boiling water. The *barium salt*, $(C_5H_7O_2)_2Ba + 4H_2O$, is more soluble than the calcium salt, but much less soluble than the corresponding salt of angelic acid. It forms small hard prismatic crystals. The *silver salt* is less soluble than that of angelic acid, but may be crystallized from boiling water in small white feathery groups. The *potassium salt* crystallizes readily in tufts of small needles, which are not deliquescent.

Conversion of Angelic Acid into Tiglic Acid.—The transformation of angelic acid into the isomeric tiglic acid by the action of heat or of concentrated sulphuric acid was observed by Demarçay (*Comptes Rendus*, lxxxiii., 906), whose statements are fully confirmed by the author. A quantity of pure angelic acid, after being kept in a state of gentle ebullition for forty hours, was found to be almost entirely transformed into tiglic acid.

Angelic and Tiglic Acids. A. Pagenstecher. (*Ibid.*, cxcv., 108-128.) To separate these acids, the author takes advantage of the peculiar behaviour of their calcium salts. Calcium angelate is more soluble in cold water than in hot; calcium tiglate, on the contrary, is more soluble in hot water than in cold. When, therefore, a concentrated solution of the two salts is heated to 60° or 70° , calcium angelate is thrown down, whilst calcium tiglate remains in solution. By appropriate application of these facts it is possible to separate nearly the whole of a mixture of the two acids in the form of pure calcium salts, from which the acids are liberated by the addition of hydrochloric acid.

The remainder of the paper deals with the products of the action of hydrobromic acid and of bromine upon the two acids.

Constitution of Tiglic and Angelic Acids. R. Fittig. (*Ibid.*, cxcv., 128-130.) Tiglic acid has recently been shown by Schmidt and Berendes (see *Year-Book of Pharmacy*, 1878, 115), to be identical with methylcrotonic acid, the accepted formula of which is—



The observations of Kopp, Köbeg, and Pagenstecher, as detailed in the foregoing papers, are all in accord with this formula. The derivatives of tiglic acid described by Pagenstecher may be formulated as follows:—

Hydrotiglic acid, $\text{C Me H}_2. \text{C Me H. C O O H.}$

Bromhydrotiglic acid, $\text{C Me H}_2. \text{C Me Br. C O O H.}$

Dibromhydrotiglic acid, $\text{C Me H Br. C Me Br. C O O H.}$

The constitution of angelic acid is still an open question, no sufficient light being thrown upon it, or upon the relation of the two isomeric acids to each, by these researches.

Salicylate of Atropine. Dr. Tichborne. (*L'Union Pharmaceutique*, 1878, 323.) This salt is soluble in 20 parts of water, and undergoes no change on exposure to the air. For application to the eye it possesses the advantage of not producing any irritation. The author directs it to be prepared by dissolving 130 parts of salicylic acid and 270 parts of atropine in alcohol, and allowing the solution to evaporate.

Daphnetin. C. Duenkel. (*Ber. der deutsch. chem.-Ges.*, 1879, 109.) The author obtains this substance by heating an alcoholic solution of commercial extract of mezereon (thus splitting up the glucoside daphnin into daphnetin and glucose), evaporating on a water bath, exhausting the black residue with boiling water, con-

centrating the united decoctions by evaporation, removing the colouring matter by means of a small quantity of lead acetate, and then precipitating the daphnetin by a farther addition of lead acetate. The precipitate, which is a combination of daphnetin with oxide of lead, is suspended in water, decomposed with sulphuretted hydrogen, and the filtrate decolorized by animal charcoal, and evaporated.

Daphnetin crystallizes from its solutions in boiling water or dilute alcohol in yellowish white prisms, which are only very slightly soluble in ether, chloroform, carbon bisulphide, and benzol. It forms reddish yellow solutions with caustic alkalies and alkaline carbonates, and red solutions with concentrated sulphuric acid. From the latter it is precipitated by water.

Note on some Reactions of Magnesia Mixture. H. d'Arcy Power. (*Chem. News*, xxxix., 225.) The author has observed that most potassium and some sodium salts precipitate magnesium hydrate from a solution of ammonio-chloride of magnesium. Potassium iodide possesses this property in a marked degree. Thus the addition of 15 c.c. of a 10 per cent. solution of potassium iodide with 10 c.c. of ammonia to 5 c.c. of magnesia mixture (prepared by dissolving 5 grams of magnesium oxide in 40 c.c. of hydrochloric acid, and then adding 60 c.c. of ammonia and filtering), after standing twenty-four hours gave a precipitate which, when washed and ignited, weighed 0.046 gram; it was pure MgO, so that a considerable portion of the MgO was precipitated. Potassium bromide gave, under similar circumstances, a precipitate weighing 0.002 gram. Further results are promised.

Notes on Albumen and some of its Combinations. A. Heynsius. (*Chem. News*, October 4, 1878, from *Archives Néerlandaises*.) The alkaline albuminates differ according to the degree of concentration of the alkali employed. Weak alkalies give rise to a combination which does not yield in solubility to paraglobulin. The acid albumens differ equally according to the energy and degree of concentration of the acid. M. Aronstein had about the same time arrived at the following results:—"That by dialysis albumen can be obtained free from salts; that the albumen, both of blood and of eggs, is soluble in water, and does not coagulate on boiling, even after the addition of an acid; that the coagulation of these two species of albumen under the influence of heat is due to the presence of foreign salts." The results are diametrically opposite to those of the author. He concludes that Aronstein and Schmidt regarded their dialysed albuminous solutions as free from salts, because they in-

cinerated too small quantities of the matter; that their solutions remained limpid on heating, because they still contained alkali; and that they did not obtain coagulation after the addition of an acid, because such acid was used in excess. He finds that after the most complete dialysis, there is obtained a combination of albumen with phosphate of lime and magnesia which is soluble in water, but a really neutral solution of which abandons albumen in a coagulated form at the boiling temperature; that it is not possible to obtain by dialysis albumen free from salts, and that we are not justified in pronouncing it a compound soluble in water.

Analysis of Phosphide of Zinc. E. Baudrimont. (*Journ. de Pharm. et de Chim.*, 1871, 1. The composition of the phosphide of zinc, which has been in use as a remedy for several years, is generally accepted to be P_2Zn_3 ; but, as is well known, there is hardly any pure sample of it in the market, and in view of the difficulty of preparing it, absolute purity can hardly be expected. It becomes of interest, therefore, to be able to ascertain the percentage of pure P_2Zn_3 in any given sample.

The author appears to have discovered a method which permits a rapid and tolerably correct assay of the compound. This method is based on the following facts:—(1) On treating zinc phosphide with acids no hypophosphite is formed, but all the phosphorus is disengaged as phosphuretted hydrogen (PH_3). (2) This latter gas is completely absorbed by a solution of copper sulphate, while any uncombined hydrogen is unaffected by it. The assay is conducted in the following manner:—

A portion of the phosphide of zinc is reduced to a fine powder; 0.5853 gram of this is wrapped in a small piece of cigarette paper, and the small package, after being rolled between the fingers, inserted into a test tube filled with mercury and standing in the mercury bath upside down, that is, arranged as for the collection of gases over mercury. Care must be taken that no air-bubbles are inclosed with the package. By means of a curved pipette, 10 c.c. of tolerably concentrated hydrochloric acid are then injected into the test tube from below. As soon as the acid has reached the phosphide of zinc, phosphuretted hydrogen is given off from every particle of P_2Zn_3 present, and the column of mercury is proportionately depressed. After five or six hours the reaction will be terminated, which is shown by the level of mercury being no longer depressed, and the volume of gas is now read off. By means of another curved pipette, 15 to 20 c.c. of a rather concentrated solution of cupric sulphate are now injected, and the tube is agi-

tated so as to cause the gas to come in thorough contact with the last-named solution. The latter rapidly absorbs all the phosphuretted hydrogen without affecting the uncombined hydrogen which may be present, and which was generated by the acid acting upon the metallic zinc contained in the original sample. If no gas remains after shaking, the phosphide of zinc was pure; otherwise the salt was contaminated with metallic zinc. In the latter case, the volume of the residuary free hydrogen is deducted from the total volume of gas originally obtained, and the difference calculated as phosphuretted hydrogen. Now 200 c.c. of phosphuretted hydrogen (sp. gr. 1.185) are produced by the decomposition of 1.1706 gram of pure phosphide of zinc; hence the proportion of the latter salt in the given sample may be determined by a simple calculation.

Researches on Peptones. A. Henninger. (*Comptes Rendus*, lxxxvi., 1413. From *Journ. Chem. Soc.*) Peptones, the ultimate ducts of peptic digestion, have hitherto been found difficult to obtain in a state of purity, owing to their tendency to retain mineral salts or bases, and have yielded on incineration from 3 to 7 per cent. of ash. Maly obtained a fibrin-peptone, which yielded only 0.64 per cent. of ash, by separating the mineral substances by diffusion. The author proposed to attain the same end by starting with albuminoids free from mineral matter, and using subsequently only such reagents as could be completely removed by precipitation. Substituting, therefore, sulphuric for hydrochloric acid, he found the process required two or three times as long for completion, but the acid could then be exactly removed by baryta.

The pepsin used was of three kinds, an aqueous solution dialysed from a dog's gastric juice, a glycerin solution obtained by Wittich's method, and a very active commercial pepsin. The albuminoid matters were free from mineral matter, as detailed below.

Fibrin.—The substance after having been soaked in water containing 1 per cent. of hydrochloric acid, was tied up in a cloth, gently expressed, and hung in distilled water, which was constantly changed; the mass in the cloth was frequently kneaded and squeezed; and all the acid and the salts rendered soluble by the acid were thus removed in the course of three or four days. The gelatinous mass was then thrown into absolute alcohol, which was changed several times; the fibrin, after a final prolonged treatment with ether, to remove fatty matters, did not yield more than 0.29 per cent. of ash.

Albumin, purified by dialysis, yielded only 0.48 per cent. of mineral matter.

Casein.—Skimmed milk was mixed with $\frac{1}{200}$ th of soda solution,

and freed from fat by four successive treatments with ether; the product was then partially neutralized with dilute phosphoric acid, and mixed with a little hydrocyanic acid to hinder putrefaction. This liquid was subjected to dialysis for twelve days, changing the water twice a day; the casein was then separated by adding acetic acid and boiling, and was washed with water.

The purified albuminoid matter is heated at 44° , with five times its weight of water containing $\frac{3}{1000}$ th of H_2SO_4 , and the quantity of pepsin requisite to secure rapid digestion. After three or four days the liquid is filtered, freed from all its sulphuric acid by baryta, and evaporated at 60° – 70° . Alcohol is gradually added to the syrupy residue, until the liquid becomes turbid and separates on standing into two layers; the lower consists of a little impure peptone, and contains the greater part of the colouring matters. The upper layer is poured in a fine stream into six times its volume of 98 per cent. alcohol, which is meanwhile vigorously stirred; the peptone which settles down is dissolved in a little water, and reprecipitated by alcohol; and this process is repeated. The peptone is then treated with absolute alcohol, first cold and then warm, and finally several times with ether. These treatments with alcohol and ether render insoluble a small quantity of albuminoids which remain as a residue on redissolving in water; one more precipitation with alcohol yields a peptone perfectly soluble in water. A trace of impurity, detected by a slight turbidity being produced with acetic and potassium ferrocyanide, can be entirely removed by dialysis continued for about ten days. A small quantity of perfectly pure peptone was thus obtained.

The peptones prepared from fibrin, albumin, and casein are amorphous, infusible, white powders, very soluble in water and in glacial acetic acid. They behave like feeble amidated acids. In an acetic solution of the peptones, sulphuric, hydrochloric, or nitric acid produces at once an abundant white precipitate, consisting of a salt of the peptone, corresponding to the acid used. The different peptones show no difference in their reactions; they differ from albuminoids in being less easily coagulated and precipitated; they very nearly resemble gelatine, but their hot solutions do not set on cooling. The peptones prepared from albumin, fibrin, and casein show different rotatory powers; that from albumin causing least, and that from casein most rotation. So long, therefore, as the albuminoids which differ in their rotatory power are allowed to be different varieties, we must also admit the existence of varieties of peptones.

The Action of Animal Charcoal on Salts. L. Liebermann. (*Zeitschr. für analyt. Chem.*, 1879, 95; from *Sitzungsber der Akad. d. Wissensch. zu Wien*, No. 75.) The author's researches show that the filtration of saline solutions through animal charcoal not only causes a retention of many salts on the filter, but that, with a number of salts, it results in an actual decomposition. Neutral solutions of such salts, when passed through a charcoal filter, yield an acid filtrate, while the whole of the base, together with a smaller or larger portion of the acid, is retained by the charcoal.

Formation of Oxalic Acid during the Destruction of Organic Matter in Toxicological Analyses. M. van Melckebeke. (*Journ. de Pharm. et de Chim.*, 1878, 125; from *Bullet. de l'Academie royale Méd. Belgique*.) The destruction of organic matter by potassium chlorate and hydrochloric acid, frequently resorted to in the search for arsenic and other metallic poisons, is shown by the author to be always accompanied by the formation of oxalic acid. 100 grams of beef thus yielded 0.021 gram of this acid; the same quantity of milk yielded 0.117 gram; while 0.900 gram of this acid was obtained from 100 grams of calf's liver, and 0.374 gram from the same quantity of ox blood.

This observation appears important, in so far as it may prevent oxalic acid found in toxicological analyses from being erroneously regarded as a pre-existing constituent of the substance under examination.

Glucoside of Buckthorn Berries and Rhamnoduleite. C. Liebermann and O. Hörmann. (*Ber. der deutsch. chem.-Ges.*, xi, 952. From *Journ. Chem. Soc.*) An examination by the authors of the glucoside extracted by alcohol from the berries of buckthorn (*Rhamnus infectorius*) has led to some results differing from those arrived at by previous experimenters. The glucoside was first prepared pure by Gellatly, who called it xanthorhamnin, the name adopted by the authors. It is identical with Schutzenberger's α -rhamnegin. The properties of the substance, as described by these chemists, agree with the observations of the authors.

Xanthorhamnin does not ferment with yeast. When boiled with dilute sulphuric acid it readily breaks up into rhamnetin and sugar (*rhamnoduleite*), the former of which is desposited in tufts of lemon-yellow needles, agreeing in composition with Schutzenberger's formula, $C_{12}H_{10}O_5$.

Rhamnoduleite the authors find to be (contrary to the observations of Gellatly and Schutzenberger) a crystallizable sugar. It is soluble in water and absolute alcohol, and crystallizes from the

latter in hemihedral tables. The aqueous solution yields holohedral crystals, which melt at 92° – 93° . Dried in the air, the sugar has the formula $C_6H_{14}O_6$. When heated, it melts, and at 108° gives off 1 molecule of water: the residual $C_6H_{12}O_5$ solidifies on cooling to a brittle glassy mass, the aqueous solution of which again yields crystalline sugar. Rhamnodulcite is very sweet and agreeable in taste. It does not ferment with yeast. Its action on polarised light is dextro-rotatory. It reduces Fehling's solution on warming. Xanthorhamnin yields about 57 per cent. of the sugar.

Rhamnetin and Xanthorhamnin. C. Liebermann and O. Hörmann. (*Ber. der deutsch. chem.-Ges.*, xi., 1618.) The authors' more recent analyses of these substances and some of their derivatives again confirm the correctness of Schützenberger's formula ($C_{12}H_{10}O_5$) for rhamnetin, but show that his formula for xanthorhamnin, $C_{24}H_{32}O_{13}$, ought to be changed to $C_{48}H_{66}O_{29}$.

Action of Ammonium Salts on Metallic Sulphides. P. de Clermont. (*Comptes Rendus*, May 12, 1879. From *Chemical News*.) Bismuth, cadmium, and copper sulphates are not affected if boiled with a solution of sal-ammoniac, as is also the case with mercurous and mercuric sulphides. Antimony tri-sulphide is completely decomposed by sal-ammoniac, yielding ammonium sulphide, which escapes, and antimony chloride, which remains in solution. Stannic sulphide yields stannic acid, and no tin dissolves. Stannous sulphide is similarly decomposed, leaving stannous oxide. Metals not thrown down by hydric sulphide from their acid solutions, but converted by ammonic hydrosulphate either into sulphides or insoluble oxides, after the reaction of this reagent, behave in a peculiar manner with sal-ammoniac. It is already known that manganese sulphide dissolves as chloride. Iron sulphide in the same manner gives iron chloride. Nickel and cobalt sulphides dissolve likewise, though more slowly. Zinc sulphide resists longer, but ultimately dissolves also. Alumina and chromic oxide precipitated by ammonia hydrosulphate are known to be insoluble in sal-ammoniac. On these reactions the author finds a method for the separation of certain metals. If a solution contains cobalt, nickel, manganese, iron, alumina, chromium, and zinc, it is precipitated with ammonia hydrosulphate, the mixture added to a boiling solution of sal-ammoniac, and kept in ebullition for a sufficient time. On filtering, the filtrate contains all the iron and manganese, part of the cobalt, nickel, and zinc; whilst the undissolved portion contains all the aluminium and chromium, with the residue of the nickel, cobalt, and zinc. The analysis is completed by known methods. If iron

and manganese alone have to be separated from aluminium and chromium, the process is complete and precise.

Gold as an Impurity in Silver Nitrate. E. B. Shuttleworth. (*Canad. Pharm. Journ.*, Nov., 1878.) The author points out that all commercial refined silver contains minute traces of gold, and that this impurity also frequently occurs in the nitrate. If such metallic silver be dissolved in ordinary nitric acid, containing traces of hydrochloric acid, both metals will be dissolved, and, as long as the solution is acid and concentrated, minute quantities of both chloride of silver and chloride of gold will be retained. Crystals deposited from the liquor will also contain traces of gold. Such crystals have a faint purplish tinge, as also the solution, so that in colour it resembles water containing a very small quantity of log-wood ink.

The author is not prepared to say in what particular form or combination the gold exists in the silver salt, nor yet to state the effect of this impurity on the photographic film. It is, however, possible that some of the troubles of photographers—as for instance, that technically known as fogging—might in some degree be due to the presence of this contamination.

Nitrate of silver containing gold may be purified by fusion; on dissolving the cake in water the gold will be deposited, and may be removed by decantation or by filtration through asbestos.

The Detection of Alum in Flour and Bread. F. M. and G. Rimmington. (*Pharm. Journ.*, 3rd series, ix., 41.) The usual mode of detecting and estimating alum in adulterated flour and bread, by calculating for alum the aluminium phosphate found in the ash in excess of a certain quantity, is objected to by the authors on the ground that alumina in much larger proportion than is generally supposed is quite compatible with perfect freedom from alum. They prefer to extract the alum as such by means of dialysis, and recommend the following mode of procedure:—

Shake 50 grams of the flour in a litre flask with 200 c.c. of rectified spirit until a perfectly uniform mixture is obtained; then add distilled water to make up 1 litre. Allow the mixture to stand for twenty or thirty minutes with occasional agitation, after which pour it upon a large filter. Take any proportion of the filtrate and place it in a dialyser, and allow this to float twelve hours; at the expiration of that time change the water in the dish, allow to dialyse for another twelve hours, and repeat the process for a third and fourth time, until the last dialysate entirely ceases to give any reaction for sulphuric acid. The united solutions are now reduced to a small bulk by

evaporation, the sulphuric acid precipitated from the residue by barium chloride, and the precipitate collected, dried, and weighed. It is obvious that any salt of sulphuric acid present in the flour must appear in the dialysate, and the only problem to settle will be its proportion to the alumina found by incineration. The dialysate may also be tested for alumina.

Should the quantity of sulphuric acid found amount to no more than a mere trace, it must not be ascribed to alum, but to the sulphates normally occurring in minute quantities in pure flour.

In the case of bread a modification of the above process has to be adopted. The bread should be dried, powdered, then digested in the diluted spirit, and filtered. This filtrate can be used in exactly the same way as in the former processes. But the fact that soluble sulphates may exist in the water with which the bread has been made must not be overlooked. This difficulty may be met by testing the filtrate with the logwood test, the operation being performed in Nessler glasses on a white ground.

The authors have given special attention to the logwood test, and find its indications of alum as delicate as those of arsenic by Marsh's test, provided the logwood used is of good quality. Instead of a tincture made from the wood, a solution of the extract in diluted spirit may be used with equal advantage. With due care they claim to be able to detect alum if present in even so small a proportion as one part per million. Three modes may be followed:—

1. A portion of the filtrates obtained from the flour or bread by elutriation may be tested as for ammonia in a Nessler glass.
2. The dialysate may be tested in the same way.
3. The flour itself may be tested by mixing in a small porcelain dish 2 grams with 2 c.c. of water, and adding 1 c.c. of the test.

If comparative trials be made at the same time with pure water and pure flour, the difference is most remarkable.

For a while the colour develops and grows deeper, then changes a little, and finally fades.

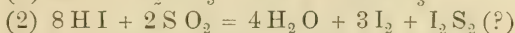
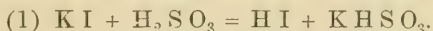
Lactucone. N. Franchimont and Wigman. (*Ber. der deutsch. chem.-Ges.*, xii., 10.) Lactucarium, from *Lactuca altissima*, when exhausted with water and weak spirits of wine, leaves a residue from which boiling alcohol extracts lactucone. The latter separates on cooling in wart-like granules, which, after repeated recrystallization from hot alcohol and purification with animal charcoal, yield colourless microscopic crystals corresponding in composition to the formula $C_{14}H_{24}O$. They are insoluble in water, sparingly soluble in cold alcohol, and freely soluble in petroleum. Their fusing point

is 296°C . By the action of phosphorus pentasulphide lactucone yields a hydrocarbon of the formula $\text{C}_{14}\text{H}_{23}$, which boils between 247° and 252° .

The author regards lactucone as homologous with camphor and Paterno's zeorin.

Reaction of Sodium and of Potassium Iodide with Sulphurous Acid. A. E. Menke. (*Chem. News*, xxxix., 19.) Johnson, in his investigation of potassium tri-iodide, noticed that on mixing strong solutions of potassium iodide and sulphurous acid, a yellow colour was produced, which was not blackened by more sulphurous acid, but disappeared on adding water. Gmelin (*Handbook of Chemistry*, Watts, ii., 263) states on the authority of Saladin (*Journ. Chem. Med.*, vii., 528, that hydriodic and sulphurous acids in aqueous solution form a yellow liquid, brighter in proportion to the concentration, and from which, eventually, sulphur is separated. Having verified this statement, the author inferred that the yellow colour given by potassium iodide with sulphurous acid was due to the action of the latter upon the hydriodic acid set free, and he endeavoured to isolate the substance causing the colour. That it could not be iodine was shown by its resisting the action of excess of sulphurous acid, and by its not colouring carbon disulphide. When the yellow solution was shaken with ether, the latter was very slightly coloured, but on adding a little alcohol and again shaking, the ethereal layer acquired a bright yellow colour, and when drawn off and evaporated it left a brown oily substance, having a pungent odour somewhat resembling that of bromine. On heating moderately, it evolved vapour of iodine. The author made several attempts to obtain it in a state fit for analysis; but the yield was always small, and there was a tendency to the separation of plates of iodine. He, therefore, tried to obtain it by the action of sulphurous acid gas upon iodine dissolved in ordinary alcohol, hoping that, the quantity of water present being very small, a larger quantity of the yellow substance would be produced. One ounce of iodine was dissolved in 26 c.c. of alcohol, and sulphurous acid was passed in to complete saturation; the liquid remained of a dark brown colour, which disappeared immediately on adding excess of water. As it did not deposit anything after some days, and was found to contain a little free iodine, small quantities of water were added, and more sulphurous acid gas was passed in until no more free iodine could be detected, although the liquid had still a dark brown colour. On standing it deposited a plastic substance resembling the amorphous form of sulphur. This was freed by pressure

from adhering mother-liquor, when it weighed 0.140 gram. On oxidizing it with fuming nitric acid, and precipitating with barium chloride, it gave barium sulphate corresponding to 60 per cent. of sulphur. Though disappointed in isolating the substance, the author submits that his experiments justify the conclusion that the yellow body formed when sulphurous acid acts upon concentrated solutions of potassium and sodium iodide, is an unstable iodide of sulphur, and would suggest the following equations explaining the reaction :—



The Quantitative Blowpipe Assay of Mercury. G. Attwood. (*Chem. News*, xxxix., 111.) The author divides compounds to be assayed into three classes. Class A, containing metallic mercury, cinnabar, tiemannite, suboxide, protoxide, and mixed sulphides. Class B, calomel, corrosive sublimate, and iodide of mercury. Class C, amalgams of gold, silver, copper, lead, zinc, tin, etc.

Class A.—10 to 20 grains of the ore, finely powdered and passed through a sieve, 2000 holes to the linear inch, are mixed with 5 to 10 times their weight of powdered litharge, and distilled over a spirit lamp in a small glass retort, $1\frac{1}{2}$ inches long and $\frac{1}{4}$ inch diameter. To this retort is fitted by means of a cork a glass tube, slightly curved, $2\frac{1}{4}$ inches long, and $\frac{1}{10}$ of an inch in diameter. The end of this tube dips under water contained in a small porcelain crucible. The operation lasts only a few minutes. The mercury is carefully collected from the glass tube and crucible. The retort is broken up and its contents carefully powdered and examined by a lens for mercury. The globules are then united by gently warming under water, and the dry mercury weighed.

Class B.—A quantity of the finely powdered ore, equal to 10 grains, is mixed with three times its volume of cyanide of potassium. The apparatus closely resembles that used in Class A, but the retort has a small bulb.

Class C.—These amalgams are sometimes powdered with difficulty, and it is often advantageous to add a known weight of pure mercury, so as to render them semi-fluid before distilling. 10 to 30 grains of the amalgam are usually taken for an assay. A turned steel retort is used for distillation, which is effected in a small charcoal furnace heated by a blowpipe flame; the head of the retort is accurately ground to fit over the body. The retort, including the cup and cap, is 1 inch high; the neck of the cap is 2 inches long. The paper

contains full-size illustrations of the different retorts, etc., which are made by Casella. The author has had much experience, and states that most accurate results can be obtained with the above apparatus.

Hyponitrous Acid. J. D. van der Plants. (*Zeitschr. des oesterr. Apoth. Ver.*, 1878, 318.) During an investigation of the products of the action of sodium amalgam on alkaline nitrates, E. Divers, in 1871, obtained a liquid which, after neutralization with acetic acid, gave with silver nitrate a yellow precipitate of the formula Ag N O . As the analysis published at the time did not quite agree with this formula, the author considered it desirable to reinvestigate the subject.

A solution of potassium nitrite in three times its weight of water, when gradually mixed with an excess of sodium amalgam, evolves much heat, and liberates a mixture of gases consisting of 40 per cent. of nitrogen, and 60 per cent. of nitrous oxide. Upon neutralizing the resulting solution with acetic acid and adding solution of silver nitrate, a precipitate is obtained consisting of acetate and hyponitrite of silver, the former of which is rapidly decomposed by light, so that the subsequent treatment of the precipitate with dilute sulphuric acid leaves silver oxide undissolved, while the hyponitrite passes into solution from which it can be precipitated by neutralization with ammonia. The yield amounts to only one-tenth of the weight of the potassium nitrite employed.

The analyses of the precipitate gave numbers most fully confirming the formula Ag N O , and thus proving it to be indeed hyponitrite of silver.

It is amorphous, pale yellow, not affected by light, and not altered at 100°C ., but is decomposed at 110°C ., with the formation of nitrate, and leaves metallic silver upon ignition. When rapidly heated to 150° it explodes, with the evolution of brown fumes. It is insoluble in water, but readily soluble in dilute nitric and sulphuric acid, and is completely reprecipitated from these acid solutions by alkalis. It is not decomposed by carbonic acid, and not acted upon by solution of sodium hydrate below 70°C . Phosphoric acid, sulphuretted hydrogen, and boiling acetic acid, liberate from it hyponitrous acid.

The free hyponitrous acid is most readily obtained by the action of hydrochloric acid upon an excess of the silver salt. It is a colourless, strongly acid liquid, which can be boiled with acetic acid, and even with nitric acid, without suffering decomposition. It forms a yellow precipitate with silver nitrate, turns blue a solution of potassium iodide mixed with mucilage of starch, and reduces potassium permanganate. On exposure to air, however, it under-

goes gradual decomposition, so that only traces of it can be detected after a few weeks.

Concentrated sulphuric acid splits it up into water and pure nitrous oxide.

The formula of the free acid is HNO .

Process for the rapid Estimation of Morphine in Opium. A. Petit. (*Journ. de Pharm. et de Chim.* [4], xxix., 159. From *Pharm. Journ.*) The errors and difficulties inherent to the various processes followed in the estimation of morphine in opium have frequently been pointed out, one of the best grounded objections being certainly that which is based on the length of the various processes. The following method appears to exclude most of the causes of the errors noticed by authors; whilst the duration of the experiment which does not exceed two hours, will facilitate assays and the commercial transactions depending on them, which are often rendered impossible by the length of the analysis.

A comparative investigation of the process now proposed and of that of Guillermond has given results always to the advantage of the new method.

The mode of operating is as follows:—Take 15 grams of the opium to be assayed, suspend it in 75 grams of distilled water, and afterwards throw it upon a filter. Take 55 grams of the filtrate, which would represent 10 grams of opium, add 3 c.c. of ammonia, and agitate. The deposit of morphine takes place rapidly in the form of a crystalline powder. The whole is allowed to stand for a quarter of an hour, and then 27 grams of alcohol of 95 per cent. are added. After shaking several times it is again allowed to stand for half an hour, and then thrown upon a tared filter. The alkaloid is washed upon the filter with alcohol of 50 per cent. After washing it only requires to be dried and weighed. The mother-liquors left to themselves deposit after forty-eight hours only a small precipitate that need not be noticed.

With the same opium the following results have been obtained. 10 grams of opium yielded by the—

New Process.	Guillermond's Process.
1.09 of Crystalline Product	1.16 of Crystalline Product con-
1.08 " "	0.92 { taining much more Narcotine.
1.16 " "	
1.11 " "	
1.06 " "	
1.07 " "	
1.06 " "	

In exact determinations advantage has been taken of the property of narcotine of not saturating acid liquors even in the presence of morphine, the quantity of acid required for the saturation of 25 centigrams of the precipitate obtained being ascertained.

For this purpose 25 centigrams of the precipitate are dissolved in 10 c.c. of a solution of sulphuric acid titrated so as to exactly saturate 25 centigrams of pure morphine dried at 120° C. This liquor contains in a litre 4.30 grams of monohydrated sulphuric acid, ($\text{SO}_3 \text{H}_2 \text{O}$).

On the other hand a solution of sucrate of lime is prepared of a strength that 10 c.c. should saturate exactly 10 c.c. of the sulphuric solution. It remains then only to ascertain how much of the sulphuric solution would be saturated by 25 centigrams of the morphine obtained in the various assays.

If the 25 centigrams should saturate exactly the 10 c.c. of sulphuric liquid, the morphine would be pure; in the contrary case, the quantity of real morphine contained in the mixture would be given in hundredths by the number of tenths of cubic centimetres of the 10 c.c. of sucrate of lime solution not required, and which remain unused, for the saturation of the 10 c.c. of sulphuric solution left unsaturated by the precipitate. In practice, in order to facilitate the solution of the morphine, it is preferable to employ 20 c.c. of sulphuric solution to dissolve the 25 centigrams of precipitate, bearing in mind that 10 c.c. of sulphuric solution are exactly saturated by 10 c.c. of the sucrate of lime solution.

It has been mentioned that narcotine does not in any way affect the estimation. Knowing that it required for the saturation of 10 c.c. of sulphuric liquid either 10 c.c. of the sucrate of lime solution or 25 centigrams of morphine, the author dissolved 25 centigrams of morphine and 25 centigrams of narcotine in 20 c.c. of the sulphuric liquid, and found that in order to saturate the excess of acid there was required exactly 10 c.c. of solution of sucrate of lime. Therefore of the 20 c.c. employed, 10 c.c. had been saturated by the morphine, and 10 c.c. left unsaturated by it.

Experiments made with various precipitates obtained gave the following results, 25 centigrams of precipitate being dissolved in 10 c.c. of the sulphuric liquid in each case:—

No. 1 required 0.7 c.c. of sucrate of lime solution to saturate uncombined acid.

No. 2 required 0.9 c.c. of sucrate of lime solution to saturate uncombined acid.

No. 3 required 0.6 c.c. of sucrate of lime solution to saturate uncombined acid.

No. 4. required 0·8 c.c. of succrate of lime solution to saturate uncombined acid.

The pure morphine present is consequently expressed in the following figures:—

No. 1	100 - 7 = 93 per cent.
No. 2	100 - 9 = 91 „ „
No. 3	100 - 6 = 94 „ „
No. 4	100 - 8 = 92 „ „

By this process the exact proportion of morphine is obtained, whilst by other methods the morphine weighed contains more or less resin or foreign extractive matter.

Salicylate of Zinc. Dr. Vulpius. (*Archiv der Pharm.*, March, 1879, 239.) The salt is soluble in water to the extent of 4 per cent., of which a portion, however, separates again on standing. A 2 per cent. solution is permanent. In alcohol and ether the salt is extremely soluble. An alcoholic solution containing 50 per cent. of the salt can be mixed with three times its weight of water without any appreciable separation taking place.

Salicylate of Copper. Dr. Vulpius. (*Ibid.*) This salt is soluble in fifty times its weight of water, and freely soluble in alcohol, but insoluble in ether. Its concentrated alcoholic solution is precipitated both by ether and by water. Solutions containing not more than 20 per cent. of the salt form clear mixtures with four volumes of water.

Santonin Derivatives. S. Cannizzaro and L. Valenta. (*Gazzetta Chimica Italiana*, viii., 309. From *Journ. Chem. Soc.*) The addition of the elements of water to santonin, $C_{15}H_{18}O_3$, gives rise to a bibasic acid, *photosantonin* acid (Sestini, *Gazzetta*, vi., 357), and to four isomeric monobasic acids, $C_{15}H_{20}O_4$, viz., the *santoninic acid* of Hesse (*Ber.*, vi., 1280), the *santonin acid* of Cannizzaro and Sestini (*Gazzetta*, iii., 241), *metasantonin acid* (*ibid.*, vi., 345), and *parasantonin acid*. These four monobasic acids differ not only in their crystalline form, solubility, and other physical characters, but also in their behaviour with reagents.

Santonin acid, when treated with phosphorous trichloride, gives rise to *santonin chloride*, $C_{15}H_{19}O_3Cl$ (m. p. 170° – 171°); the corresponding *iodide* fuses at 136° , and the bromide at $145\cdot5^{\circ}$. By passing hydrochloric acid into a solution of santonin acid in methyl or ethyl alcohol, or by the action of the haloid paraffins on metallic santonates, *methyl santonate* (m. p. 86° – $86\cdot5^{\circ}$), and *ethyl santonate* (m. p. 94° – 95°) are readily obtained. By the action of nascent

hydrogen, sodium santonate is transformed into the sodium salt of *hydrosantonio acid*, $C_{15}H_{22}O_4$, the silver salt of which yields *metasantonio acid* (*Gazzetta*, vi., 345). This isomeride of santonic acid, however, may be more conveniently prepared by distilling santonic acid under a diminished pressure of 52 to 43 mm., stopping the distillation as soon as the distillate becomes coloured, and the boiling point rises. Both the distillate and the residue in the retort are dissolved in a solution of sodium carbonate, and after agitation with ether to remove oily matters, the alkaline solution is precipitated with an acid and the *metasantonio acid* purified by crystallization from ether. *Metasantonio acid* is also formed by the action of alkaline solutions on *santonide*. *Metasantonio chloride*, $C_{15}H_{19}O_3Cl$, prepared by the action of acetyl chloride or of phosphorous trichloride on *metasantonio acid*, crystallizes in slender needles (m. p. 139°), and is moderately soluble in ether. *Methyl metasantonate* forms large, lustrous crystals (m. p. 101.5° – 102.5°). It is prepared by passing hydrochloric acid into a methyl alcohol solution of *metasantonio acid*.

Santonide.—If a solution of santonic acid in glacial acetic acid is boiled for several hours, and the acid is then distilled off until the temperature rises to 180° , a residue is left which solidifies on cooling to a viscous mass of the colour of amber. This residue is agitated with ether and an aqueous solution of carbonate of soda; the ethereal solution decanted and evaporated, and the *santonide* thus obtained is purified by repeated crystallization from ether. *Santonide*, $C_{15}H_{18}O_3$, melts at 127° – 127.5° . The quantity obtained forms but a small proportion of the product, the greater part consisting of unchanged santonic acid, which is dissolved by the alkaline solution.

Parasantonide.—This substance, isomeric with that just described, is prepared and purified in a similar manner, but the distillation is continued until the temperature rises to 260° . It melts at 110° – 110.5° . Both *santonide* and *parasantonide* are *lævo*-rotatory; but *santonide* acts the more energetically on the polarised ray.

Parasantonio acid.—This acid is prepared from *parasantonide* by boiling it with soda solution, precipitating with an acid, and purifying by crystallizing from ether or from water. It may also be obtained by decomposing the *parasantonide* with boiling dilute hydrochloric acid. The free acid forms large white crystals, which are moderately soluble in ether and in water. It is a powerful acid, easily expelling carbonic acid from its salts. The *parasantonates* are mostly very soluble in water and in alcohol, and difficult to

obtain in a crystalline state. The *barium* salt, $(C_{15}H_{19}O_4)_2Ba$, forms slender needles. Parasantononic acid, when treated with acetyl chloride or phosphorous trichloride, does not yield the corresponding chloride, but is converted into parasantonide. *Methyl parasantonate* crystallizes in hard prisms (m. p. 183° – 184°). *Ethyl parasantonate* forms colourless needles (m. p. 172°) only sparingly soluble in ether.

Hydrosantonide, $C_{15}H_{20}O_3$.—This compound may be prepared from hydrosantononic acid, and purified in a manner precisely similar to santonide and parasantonide, but is obtained in much larger quantity if the hydrosantononic acid be first heated with glacial acetic acid in closed tubes at about 150° , for four hours. It is a crystalline substance, melting at 155° – 156° .

Sulphocarbonate of Potassium and Allied Compounds. J. M. Maisch. (*Amer. Journ. of Pharm.*, April, 1879.) The sulphocarbonates were discovered by Berzelius more than fifty years ago, and the results of his investigations remain undisturbed even at the present time. The name *sulphocarbonate* indicates that these compounds have the same chemical composition as the corresponding carbonates, except that the oxygen of the latter is completely replaced by an equal number of atoms of sulphur; the formula for sulphocarbonate of potassium is therefore K_2CS_3 .

As this salt is now attracting much attention, the author supplies the following information respecting its mode of preparation and properties:—

On passing carbonic acid gas into an aqueous or alcoholic solution of potash, carbonate, and finally bicarbonate, of potassium is formed. A precisely analogous reaction is obtained if an aqueous solution of monosulphide of potassium is acted upon by carbon bisulphide; $K_2S + CS_2$ yields K_2CS_3 . Carbon bisulphide is insoluble in water, and its solubility in this menstruum is not materially increased by the presence of a polysulphuret, or of the officinal sulphuret of potassium. The preparation of sulphocarbonate involves, therefore, the previous formation of *potassium monosulphide*; and this is most conveniently obtained by passing sulphuretted hydrogen gas into a solution of caustic potash as long as the gas is absorbed, and afterwards adding an equal bulk of the same alkaline solution. In its purest state it yields on evaporation colourless prisms of the hydrated sulphide, which are deliquescent on exposure, dissolve readily in alcohol and water, and in contact with the air become oxidized. The solution in water obtained in the manner indicated, is therefore best preserved in well filled bottles, or it is at once agitated with carbon bisulphide, as long as the latter is

dissolved. The combination is effected in a stoppered bottle at a temperature of 30° C. (86° F.); as the carbon bisulphide dissolves, the liquid acquires a yellow, brown-yellow, or red-brown colour, according to the concentration and purity of the solution. On careful evaporation at the temperature indicated, and subsequent cooling, yellow crystals of the hydrate are obtained, which at a somewhat higher temperature part with their water and leave the anhydrous compound. *Potassium sulphocarbonate* is very deliquescent, freely soluble in water, sparingly soluble in alcohol, and has a cooling, afterwards pungent and peppery, and finally somewhat sulphurous taste.

The sparing solubility in alcohol of potassium sulphocarbonate, and the free solubility in the same liquid of potassium monosulphide, suggests the preparation of the former from an alcoholic solution of the latter. On adding to such a concentrated solution carbon bisulphide as long as this is taken up, the liquid will gradually separate into two or three layers, the lowest of which is a syrupy solution of the compound desired. But for the purposes for which potassium sulphocarbonate is employed, it is obtained sufficiently pure by the process described before.

If a *watery* solution of caustic potash is agitated with carbon bisulphide, the latter is gradually dissolved, yielding a brown liquid, which contains both carbonate and sulphocarbonate of potassium in solution; $6\text{KHO} + 3\text{CS}_2$ yields $\text{K}_2\text{CO}_3 + 2\text{K}_2\text{CS}_3 + 3\text{H}_2\text{O}$. Both newly formed compounds have a similar behaviour to water and alcohol, and therefore cannot be separated either by crystallization or by precipitation with alcohol; and since the application of strong solutions of alkaline carbonates is inadmissible, the process described cannot be advantageously used for the preparation of potassium sulphocarbonate. Such a solution will effervesce briskly on the addition of diluted hydrochloric or sulphuric acid, and after the neutralization of the liquid the further addition of acid will render the mixture milky from the separation of *sulphocarbonic acid*, H_2CS_3 , which gradually forms a heavy red-brown oil, capable of decomposing the carbonates with the evolution of carbonic acid gas.

On treating an *alcoholic* solution of caustic potash with carbon bisulphide, the reaction is very different from the preceding, and results in the production of *sulphocarbonate* of potassium; $\text{KHO} + \text{C}_2\text{H}_6\text{O} + \text{CS}_2$ yields $\text{KC}_2\text{H}_5\text{OCS}_2 + \text{H}_2\text{O}$. This salt gives with a solution of sulphate of copper a yellow precipitate, and the acid contained in it has also been known as *xanthonic*, *xanthic* and *xanthogenic acid*; it was discovered by Zeise in 1822.

By substituting in the above processes caustic soda or lime for the potash, corresponding sodium and calcium compounds are obtained. The soluble sulphocarbonates yield brown precipitates with salts of copper, red ones with salts of lead, and yellow ones with mercuric, cadmium, and silver salts. Many of these compounds with the heavy metals are gradually turned black.

Sulphocarbonates are now used for the destruction of phylloxera, and of insects infesting plants and flowers, and also as fertilizers. They also appear to be adapted as remedies in certain skin diseases.

Spergulin. C. O. Harz. (*Chem. Centr.*, 1879, 24. From *Journ. Chem. Soc.*) Spergulin occurs in the seed coverings of *Spergula vulgaris* and *S. maxima*. It is produced at the time when the seeds blacken and are nearly ripe. Spergulin is very soluble in absolute and aqueous alcohol. Viewed by transmitted light, the solution appears nearly colourless, with a shade of olive green; by reflected light it exhibits an intense dark blue fluorescence. Spergulin has not been obtained in the form of crystals. It is very soluble in methylic alcohol, less soluble in amyl alcohol, and scarcely soluble in petroleum or in ether. Concentrated sulphuric acid dissolves it, forming a dark blue liquid. The fluorescence of an alcoholic solution of spergulin is maintained for more than a year if the liquid be kept in darkness; fluorescence is rapidly destroyed by the action of direct sunlight, and more slowly by that of diffused light.

Small quantities of caustic alkalies, or alkaline carbonates, added to an alcoholic solution of spergulin, transform it into an emerald-green fluorescent body; basic lead acetate produces a precipitate in an alcoholic solution of spergulin. The new compound contains, 61.85 per cent. of carbon, 7.05 of hydrogen, and 31.80 of oxygen; which agrees tolerably with the formula $C_5 H_7 O_2$. It appears to be related to chlorophyll, and is probably closely allied with phyllocyanin.

An alcoholic (1:8) solution of spergulin showed strong absorption, almost entirely in the violet; in this respect it differs considerably from chlorophyll, phyllocyanin, and phylloxanthin. The author is inclined to regard spergulin as a feeble acid, the acid salts of which, as well as the acid itself, exhibit blue fluorescence, and the basic salts are without fluorescent properties.

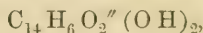
Note on the Reaction of Codeine with Sulphuric Acid and Ferric Chloride. Dr. O. Hesse. (*Archiv der Pharm.*, xii., 330.) The author has previously shown that codeine forms a blue solution with sulphuric acid containing a little ferric chloride, and a colour-

less solution with sulphuric acid alone. As the action of sulphuric acid upon the crystalline alkaloid is very slow, he now recommends the employment of codeine previously dried in an exsiccator and finely powdered.

Dr. Hesse attributes the pink colour obtained by Calmberg by moistening codeine with sulphuric acid to the presence of impurities.

The Chemistry, Pharmacy, and Therapeutics of Chrysophanic Acid. J. L. Macmillan. (*Pharm. Journ.*, 3rd series, ix., 755.) Since chrysophanic acid has been so prominently brought before the medical and pharmaceutical public by B. Squire and others, a more detailed account of its properties will probably be welcome to the readers of the *Year-Book*; and we therefore give a somewhat copious extract of the author's report on this subject:—

Chrysophanic acid, Rheic acid, sometimes called Rhein—



takes its name from two Greek words, signifying to appear golden. It belongs to the anthracene group of carbon compounds, and, like

alizarin, is regarded as *dioxyanthraquinone*, $\text{C}_{14}\text{H}_6\text{O}_2'' \left\{ \begin{smallmatrix} \text{OH} \\ \text{OH} \end{smallmatrix} \right\}$. It

crystallizes in six-sided prisms, is tasteless, and may be sublimed without decomposition. It is contained in araroba to the extent of nearly 50 per cent., and in almost all the varieties of rheum to a considerable extent, as also in most varieties of dock—*Rumex patientia*, *R. palustris*, *R. acutus*, *R. aquaticus* (*Hydrolapathum*), and *R. obtusifolius*. The *R. aquaticus* is reputed to possess antiscorbutic properties (Pereira). It is also contained in *Lichen orella*, which fact seems to have led Mr. Kemp to conclude, and there were strong reasons for his arriving at such conclusion, that the Goa powder, as met with in the bazaars of India, was prepared from this substance. The samples operated on by him yielded 42.89 per cent. of a substance soluble in benzol and in alkalis. It is found in considerable quantities in common yellow lichen, *Parmelia parietina*, which has been used as a remedy for intermittent fevers; in several varieties of senna, and in *Cassia alata*. This latter is called by the Malabars the "ringworm bush," and is used as a remedy for psoriasis, herpes, scabies, and syphilitic eruptions, and is supposed to be a specific for the bite of the centipede, tarantula, and scorpion. A yellow powder prepared from it, and much resembling araroba, is hawked about the country by Tamil empirics, and eagerly bought up by the coolies, who regard it as a specific for all diseases; and on large estates seldom a day passes without meeting

several labourers bedaubed with it, not only for the cure of skin diseases, but for fever, headache, etc. It certainly is effective in subduing eruptions of the skin; but as for its other ascribed virtues, they exist, in the author's opinion, only in the imagination and unlimited faith of the coolie. He has found it successful in allaying the irritation produced by mosquito bites. The fact that the juice of the dock-leaf allays the irritation caused by the sting of the nettle may be ascribable to the fact of its containing chrysophanic acid, as does the *Cassia alata*, which is common in the mountain province of Ceylon; as is also *C. occidentalis*, *C. Sophera*, and *C. Tora*, whose leaves and roots possess the same therapeutic properties.

Cathartin.—The active principle of senna is composed of chrysophanic acid, a dextro-rotatory glucose, and chrysophanin. The acid may be separated by exhaustion with ether. It is present in but small quantity in senna, but it is at once rendered evident by the formation of a characteristic red colour with ammonia, when added to an aqueous infusion of the leaves.

It may be prepared from either rhubarb or senna, by treating the powdered root of the former and leaves or petals of the latter with caustic potash, precipitating the filtrate, and dissolving the washed and dried precipitate in chloroform; which on evaporation leaves the acid in granular crystals of a pure yellow colour. The substances obtained from rhubarb root, and known in commerce as *phæoretin* and *erythroretin*, are, according to Batka, nothing but impure chrysophanic acid; the former in a half charred condition, the latter contaminated with tannic acid.

According to Rochleder (*Chem. News*, xx., 178), the acid prepared from rhubarb usually contains *emodin*. On boiling it with carbonate of soda, and filtering at a boiling heat, the emodin dissolves with blood-red colour, whilst nearly all the chrysophanic acid remains undissolved; and when further purified by recrystallization from alcohol of 90 per cent., gives on analysis numbers agreeing with the formula $4(C_{14}H_{10}O_4)H_2O$. Dried at $100^{\circ}C$., he says, it retains water, which can only be expelled at $115^{\circ}C$., aided by a current of dry carbonic acid gas.

According to Graebe and Liebermann, being isomeric with alizarin, $C_{14}H_8O_4$, it, when treated with zinc dust, is converted into anthracene. It contains only two atoms of H replaceable by acid radicals.

A solution of the acid in benzoyl chloride, heated nearly to the boiling point of the latter, gives off H Cl, and yields dibenzoyl chrysophanic acid $-C_{14}H_6(C_7H_5O)_2O_4$, or $-C_{14}H_8(C_7H_5O)_2O_4$, as a

fibro-crystalline mass, which dissolves sparingly in alcohol, and crystallizes from benzol, or better from a mixture of benzol and alcohol, or amylie alcohol, in long irregular hexagonal prisms. Melts at 200° C., and gives off at a higher temperature yellow vapours, smelling like bitter almond oil, and is not decomposed by ammonia.

With acetyl chloride it gives acetyl chrysophanic acid, crystallizable, but difficult to purify.

Gently heated with phosphorous pentachloride, it gives a body which reacts like chrysophanal chloride, being converted into chrysophanic acid by boiling with water.

With fuming nitric acid it gives a solution, in which it deposits, after a few days, large laminar crystals of *chrysammic acid*, identical in every respect with that obtained from aloes.

Liebermann (*Zeitschr. für Chem.* [2], iv., 503) regards chrysammic acid as *tetranitrom-dioxyanthraquinone*, or tetranitro-chrysophanic acid, $C_{14}H_8N_4O_{12} = C_{14}H_6(NO_2)_4(HO)_2O_2$.

Kubly (*Bull. Soc. Chem.* [2], x., 293) says that the alcoholic extract of rhubarb yields an orange-red substance, which he terms *chrysophane*, $C_{16}H_{18}O_8$, which is resolvable by acids into chrysophanic acid and sugar.

Chrysophanin may be obtained by treating the aqueous extract of senna, from which the mucilaginous matter has been removed by alcohol, with lead acetate, decomposing the precipitate with hydrogen sulphide, evaporating the liquid to the consistency of a syrup, treating this with alcohol, dissolving the residue in water, reprecipitating with alcohol, and drying over H_2SO_4 . Thus obtained it is almost white.

Chrysophanic acid is generally accompanied by traces of resin, which may be precipitated by the addition of ether to the alcoholic solution. The following salts of chrysammic acid are known:—

Potassium chrysammate, $C_{14}H_2K_2(NO_2)_4O_4 + 3H_2O$.

Barium chrysammate, $C_{14}H_2O_2''(NO_2)_4O_2Ba + 2H_2O$, obtained by adding barium acetate and acetic acid to a solution of the potassium salt.

Lead chrysammate, $C_{14}H_2O_2''(NO_2)_4O_2Pb + 4H_2O$, produced in a similar way by using lead acetate, forming crystals of a bright bronze tint.

Hydrochrysamide, $C_{14}H_2O_2''(NH_2)_3NO_2(OH_2)$. When chrysammic acid is boiled with a solution of potassium sulphide, it dissolves with a deep blue colour, and on cooling the salt separates out in crystals, having a deep blue colour and copper-red reflection.

Chrysophanic acid, as met with in the English market, is in the form of a light powder of turmeric yellow tint, sp. gr. (approximate) 0·847. It is soluble in benzol, chloroform, turpentine, and in the fixed and volatile oils to a large extent, sparingly soluble in ether and alcohol, and insoluble in water, glycerin, and in solid paraffin. It is dissolved by sulphuric and nitric acids—in the latter to a less extent—by caustic potash and by ammonia; fuses at $123\cdot3^{\circ}\text{C}.$, and boils at $230\cdot2^{\circ}\text{C}.$ At the latter temperature it is decomposed into a dark green resin-like substance, which is largely soluble in ether.

Ol. jecoris dissolves twice its weight of the acid, yielding a mixture containing 70 per cent. Ol. olivæ, ol. pini sylvest., creasotum, ol. terebinth., ol. lavand., and vaseline, dissolve readily their own weight of acid, yielding mixtures containing 52 per cent. Taking advantage of its solubility in the fixed oils, a considerable saving may be effected in preparing ointments direct from araroba. Ol. olivæ thoroughly exhausts that substance, yielding the acid, after removal of the oil by ether, in a state of purity. The Cingalese doctors take advantage of this fact, and fry the leaves of the *Cassia alata*, *C. Tora*, *C. occidentalis*—called by them *Penni tora*,—and *C. Sophora*,—called *Ooroo tora*,—in gingely oil, and in castor oil, and use the strained product as an ointment for ringworm, itch, and other skin diseases.

It is soluble in caustic potash and ammonia; in the former at once, and in the latter after some hours. The ammonia product on treatment with alcohol yields a beautiful pink lake; and the potassium product a subdued purple. These crude potassium and ammonia solutions yield all the shades and tints of the common and rarer seaweeds, and should be a valuable acquisition to botanical and natural history artists. The colour may be applied with a pen, as ink, with the brush, or clean impressions may be taken from blocks. The author has tried the colours on fabrics of silk, wool, and cotton, and finds them comparable with established dyes, the tincture from the ammonia product lending to silk a tint which artists would call natural pink.

The acid dissolved in SO_4H_2 is reprecipitated by the addition of water or alcohol. The nitric solution is soluble in alcohol; but after some time, the acid acting on the alcohol, heat is generated, ebullition takes place, and part of the acid, in the shape of resin, is deposited on the sides of the glass, the greater part, however, remaining in solution. The temperature registered during this action was $104\cdot4^{\circ}\text{C}.$

Therapeutics.—The action of this acid, when applied in the form of an ointment, is not yet distinctly known. It is certain, however, that it destroys both animal and organic parasites, and that it possesses strong healing powers in cases of skin eruptions attending the presence of such. It is irritant, but not directly so, and yet it allays almost all forms of skin irritation. Children suffering from eczema have been successfully treated with it at the Victoria Hospital; and yet remedies of an irritant nature are prohibited in the treatment of this affection. Practitioners antagonistic to its introduction, say that it produces eczema; and indeed it does, but in this very fact seemingly resides its virtue. About the third day after its application, vesicles may or may not appear, other than such pre-existing; and after this time, whether such action is manifest or not, the cure is perceptible, and almost invariably rapid.

Numbers of cases of psoriasis, herpes, eczema, impetigo, and lichen have been successfully treated with it in this hospital, and the ointment now takes a prominent place in the pharmacopœia of the institution. It has been used at strengths varying from 30–100 grains to the ounce, in cases under care of Mr. Cowell, Dr. Ridge Jones, Dr. Grigg, Dr. Pearson Irving, Dr. Allechin, and Dr. Albert Venn. One case of psoriasis, of nine years' standing, a girl of thirteen, whose body was almost entirely covered, was, after one month's treatment with the ointment of chrysophanic acid, 30–50 grains to the ounce, reported "body clean," and after a short antiphlogistic treatment was reported cured.

The acid has not been used internally, but from the fact that it is contained in many drugs, further experiments appear desirable.

Preparation of Chemically Pure Tartaric Acid. O. Ficinus. (*Archiv der Pharm.*, April, 1879, 310.) The author recommends zinc tartrate for the preparation of perfectly pure tartaric acid. The salt is almost insoluble, and is readily and completely decomposed by sulphuretted hydrogen with the formation of tartaric acid and zinc sulphide. The latter may then be converted into chloride by means of hydrochloric acid, and the resulting sulphuretted hydrogen used for the decomposition of a fresh quantity of zinc tartrate, while the zinc chloride may be employed for the reproduction of zinc tartrate from calcium tartrate prepared from crude tartar and calcium carbonate in the usual manner. The process, therefore, is a cheap one.

A Delicate Test for Creatinine. T. Weyl. (*Ber. der deutsch. chem.-Ges.*, 1878, 2175.) The author detects creatinine in freshly

voided urine by mixing about 5 c.c. of the cooled urine with a few drops of solution of sodium nitroprusside, and then adding, drop by drop, solution of sodium hydrate, whereupon a beautiful ruby-red coloration is produced, which after a short time changes to an intense yellow. (This yellow coloration is due to the action of the caustic soda on the nitroprusside.) The test succeeds best at a low temperature, and is interfered with by the presence of alcohol, but not by that of sugar or albumen. Normal human urine contains about 0.066 per cent. of this substance, or 3.3 miligram in 5 c.c., which quantity is readily detected by this test. Creatine does not show this reaction, but as it is readily converted into creatinine by boiling with dilute sulphuric acid, the test may thus be made available also for the detection of creatine. The presence of the latter in milk can be demonstrated in this manner.

The Alkaloids of *Veratrum Album*. Dr. C. R. A. Wright and A. P. Luff. (*Journ. Chem. Soc.*, 1879, 405.) The results of the authors' research are summarized as follows:—The *Veratrum album* roots examined contained at least five different alkaloids; of these three are well defined crystallizable, non-sternutatory bases; a fourth is amorphous and non-sternutatory; whilst the fifth is highly sternutatory.

By the method adopted (for the details of which see the *Journ. Chem. Soc.*) a rough separation of these alkaloidal constituents is readily effected, one of the crystallizable alkaloids (*pseudo-jervine*) being left behind with but little admixture after the first prolonged treatment with ether; this is, when pure, $C_{29}H_{43}NO_7$. It crystallizes anhydrous, and is non-sternutatory; it melts at 299° , and forms a crystallizable sulphate and hydrochloride, not of great solubility (especially the latter) in pure water, more soluble in presence of excess of acid and on heating. This base gives a peculiar series of colours with sulphuric acid.

Of the bases dissolved by ether on the first prolonged treatment, some are much more readily soluble in ether than others; so that on conversion into tartrates, precipitation with soda, and treatment again with much smaller quantities of ether, some are almost completely dissolved out, whilst others are mostly left undissolved. The undissolved bases contain, besides a little *pseudo-jervine*, some quantity of *jervine* (of Simon and Will); this is, when pure, $C_{26}H_{37}NO_3$, and is not a dinitrogenous base, as stated by previous observers. It crystallizes with $2H_2O$ (somewhat less if the solution be hot or very strongly alcoholic); its sulphate is all but insoluble in water, even when hot; and its hydrochloride and nitrate are very

insoluble salts. When anhydrous it melts at 237° to 239° (purest specimens), or somewhat lower (not absolutely pure specimens); with sulphuric acid it gives the same tints as pseudo-jervine.

In addition, the insoluble portion contains a large quantity of an amorphous non-sternutatory base, apparently indicated by $C_{28}H_{43}NO_5$. To this base the authors propose to limit the term "veratralbine;" it gives with sulphuric acid a colour reaction quite different from that of jervine and pseudo-jervine; a trace of the base mentioned in the next paragraph is also present.

The substances dissolved by ether on the second treatment appear to be free from any appreciable quantity of pseudo-jervine, but contain jervine and a third crystallizable non-sternutatory base, rubijervine, $C_{26}H_{43}NO_2$; this crystallizes anhydrous, melts at close upon the same temperature as jervine (236° purest specimen), forms a hydrochloride and sulphate distinctly more soluble than the jervine or pseudo-jervine salts, and gives with sulphuric acid, an entirely different colour reaction from that yielded by either of these two.

The most soluble portion contains a minute amount of a sternutatory alkaloid, yielding veratric acid on saponification (not unprobably veratrine); the great majority, however, approximates to $C_{28}H_{43}NO_5$, and is non-saponifiable, and apparently non-sternutatory. This substance gives with sulphuric acid a colour reaction identical with that of the amorphous base, *veratralbine*, above referred to, with which it is essentially identical.

With the exception of the veratric-acid-yielding constituent just referred to, none of the above alkaloids belong to the saponifiable class.

The Alkaloids of *Veratrum Viride*. Dr. C. R. A. Wright. (*Ibid.*, 421. *Chem. News*.) On treating about 18 kilograms of dried roots precisely as described in the foregoing paper, the first treatment with ether left undissolved some pseudo-jervine, the tartrates obtained from the ethereal solution yielded no veratralbine, but jervine crystallized out from the second ethereal solution on standing. Traces of rubijervine were observed. The ethereal mother-liquors dried up to a powerfully sternutatory amorphous mass, closely resembling the "veratralbine" similarly obtained from *V. album* roots. It gave on analysis, however, $C_{32}H_{49}NO_9$, the formula of cevadin; and on saponification it yielded about the theoretical quantity of cevadic acid, with a trace of veratric acid. The following table represents the approximate yield of the different bases from the two roots per kilogram:—

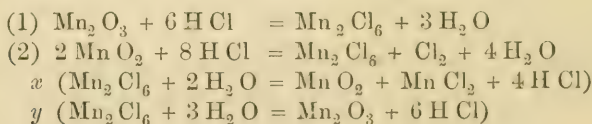
	V. album.	V. viride.
Jervine	1.30	0.20
Pseudo-jervine	0.40	0.15
Rubijervine	0.25	0.02
Veratralbine	2.20	trace
Veratrine	9.05 less than	0.004
Cevadine	apparently absent	0.43
	4.20	0.80

The jervine and pseudo-jervine from *V. viride* agreed in melting-point, properties, analytical numbers, etc., with the specimens obtained from *V. album*.

Betulin. N. Franchimont and Wigman. (*Ber. der deutsch. chem.-Ges.*, 1879, 7.) This substance was prepared by the authors from birch bark by exhausting the bark with boiling alcohol, evaporating the tinctures, treating the residue with solution of sodium hydrate, extracting the betulin by benzol or petroleum, and purifying the crystals left on evaporation by decolorizing their alcoholic solution with animal charcoal. It forms colourless, needle-shaped crystals, fusing at 251° , and corresponding in composition to the formula $C_{36}H_{60}O_3$. When acted upon by phosphorous pentasulphide it yields a hydrocarbon boiling at 250° – 255° , and probably having the composition $C_{12}H_{18}$.

The Action of Hydrochloric Acid on Manganese Dioxide. S. U. Peckering. (*Chem. News*, xxxix., 225; from a paper read before the Chemical Society, May 13, 1879.) The principal object of this paper is to criticise the conclusions drawn by W. W. Fisher in a paper "On Manganese Tetrachloride" (*Chem. Soc. Journ.*, Sept., 1878). The only conclusion at which the author arrives in common with Fisher is that when manganese dioxide is treated with cold concentrated hydrochloric acid it dissolves, forming a dark brown liquid, which evolves chlorine slowly at ordinary temperatures, and more quickly when heated. The points in Fisher's paper are stated by the author to be:—That from the liquid obtained as above, water always precipitates a definite substance, which is manganese dioxide; that the ratio which the precipitated manganese bears to the loosely combined chlorine of the higher chloride from which it is precipitated, is as 1 : 2 atoms; that this higher chloride is $MnCl_4$. The experiments, details of which are given in the present paper of forty-two pages, prove, in the author's opinion, conclusively, that from a solution of manganese dioxide in cold hydrochloric acid, water does not precipitate a definite substance; that the substance precipitated is not manganese dioxide, but a mixture of the dioxide

with the sesquioxide in variable proportions; that the ratio which the precipitated manganese bears to the available chlorine of the chloride from which it is precipitated is not 1:2 atoms: that the higher chloride produced is not Mn Cl_4 , but $\text{Mn}_2 \text{Cl}_6$. The author in conclusion sums up briefly the main points proved in his paper as follows:—When a solution of manganese dioxide in strong hydrochloric acid is diluted with water, a mixture of oxides is precipitated which is indefinite in composition, varying between 30 Mn O_2 , 5 Mn O and 36 Mn O_2 , 5 Mn O . The manganese contained in this precipitate as dioxide bears to the loosely combined chlorine of the higher chloride from which it is precipitated the ratio 1:2 atoms. The total manganese precipitated, therefore, bears to this chlorine the ratio of about 1:1.74 atoms. When the solution of the dioxide is performed in weaker acids, the amount of the higher chloride is not appreciably diminished. An increase in the actual amount of the aqueous acid employed for the solution is prejudicial to the stability of the higher chloride formed; the solution of the dioxide and sesquioxide by hydrochloric acid, and the subsequent decomposition of the sesquichloride, being represented by the following equations:—



$x:y$ being usually as 6 to 1.

The Volatile Oil of Croton Oil. Dr. E. Schmidt. (*Archiv der Pharm.* [3], xiii., 213-229. From *Journ. Chem. Soc.*) Schlippe (*Annalen*, cv., 1), states that besides crotonol, $\text{C}_9 \text{H}_{11} \text{O}_2$; stearic, palmitic, lauric, myristic, and oleic acids, also crotonic, angelic, and other higher acids of the acrylic-acid series, are to be found in croton oil, combined with glycerin. Whereas Geuther and Fröhlich (*Zeits. Chem.*, 1870, 26, 549) state that a liquid acid of the formula $\text{C}_4 \text{H}_6 \text{O}_2$ is to be found in the oil; nor can the solid acids therein contained be identified with angelic acid, but that the liquid volatile acids are acetic, butyric, and valeric acids, also a small proportion of cenanthylic acid; and perhaps other higher members of the oleic acid series. Although the solid acid has the composition of angelic acid, it is not identical therewith, but merely isomeric, as it melts at 64° ; whereas angelic acid melts at 45° . Geuther and Fröhlich have named this acid *tiglic acid*, and consider that it is

probably identical with Frankland and Duppa's methylcrotonic acid, as the ethylic ethers of both acids boil at 156° , and the melting points differ by only 2° ; they find, however, that the odours of the two acids are different, and that the barium salt of methylcrotonic acid crystallizes in a vacuum anhydrous, whereas the barium salt of tiglic acid has the formula $C_5H_7O_2Ba + 5Aq$. To ascertain the cause of these discrepancies, the author saponified 20 pounds of croton oil, and after separating the solid soap, decomposed the brown mother-liquid with sulphuric acid, and distilled to separate the volatile acids. The distillate was then neutralised with soda, and after evaporation decomposed by sulphuric acid, and the separated acids dissolved in ether. The acids dried and submitted to fractional distillation gave distillates at 160° , 160° – 190° , 190° – 205° , 205° – 270° .

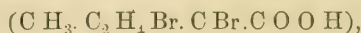
The tiglic acid which was contained in the fraction 190° – 205° , was then crystallized out by the aid of a freezing mixture. Compared with that obtained by Genther the yield of this acid was small, whereas that of the acids of lower boiling point was larger; in fact, it was found that, although the yield of volatile acids was nearly constant in all cases, the amount of the different acids present was in no constant proportion. To separate the remaining acids the distillates were dried with anhydrous phosphoric acid, and redistilled. The fractions collected at 115° – 125° , 150° – 160° , 168° – 178° , in all amounting to 15–20 grams, were the only important fractions, the remainder being insufficient for examination; propionic acid therefore was absent, or at any rate only traces were present. On applying Liebig's method of partial neutralization to each of the above fractions, the author was enabled further to separate by distillation the acids contained in those fractions. In the first, formic and acetic acids were found; in fraction 150° – 160° , isobutyric acid; in the third fraction, 168° – 178° , valeric acid, contaminated with a small quantity of tiglic acid. Methylcrotonic acid, prepared according to Frankland's method, was compared with tiglic acid, and the two were found to be identical; they both crystallize in well-formed tables, having a benzoin-like odour; in crystalline form, angles, and optical properties identical; soluble with difficulty in cold, but easily in hot water; they melt at 64° , and boil at 196° – 197° . The ethylic ethers of both acids boil at 154° – 156° , and the barium salt has the formula $(C_5H_7O_2)Ba_2 + 4Aq$.

Like methylcrotonic acid, tiglic acid is decomposed when fused with potash into acetic and propionic acids with evolution of hydrogen; but nascent hydrogen has no effect on these acids. By

treatment with fuming hydriodic acid, a solid acid melting at 86.5° is obtained, which appears to be isomeric with iodovaleric acid:—



In the same manner as angelic acid is converted into valeric acid by the action of hydriodic acid and amorphous phosphorus (Ascher, *Ber.*, ii., 685), methylcrotonic acid yields valeric acid. With bromine also it yields a dibrominated addition-product—



which melts at 82° – 83° .

Concerning the substances contained in the fractions boiling above 200° , nothing definite has been ascertained, as the amount was small; but they are probably members of the oleic series.

Reagent for Alcohol. M. Jacquemart. (*Journ. de Pharm. et de Chim.*, 1878, 432.) The author recommends a solution of mercuric nitrate for the detection of alcohol. 5 to 10 c.c. of the liquid to be tested are mixed with the reagent and allowed to stand for some time. The alcohol effects a partial reduction of the mercuric salt to the mercurous state, and upon now adding solution of ammonia, a blackish precipitate is formed, which appears the blacker the greater the proportion of alcohol present. Methyl-alcohol does not produce the same result. Coloured liquids must be decolorized with animal charcoal before applying the test.

Nitrite of Amyl. Dr. W. H. Greene. (*Amer. Journ. of Pharm.*, Feb., 1879.) Amylic alcohol which passes after two or three fractionations between 128° and 132° C., can be sufficiently pure for all pharmaceutical preparations, and should the nitrite of amyl made from it be of poor quality, a faulty process or carelessness in the rectification must have been the cause.

A very fair yield of nitrite of amyl may be obtained by the action of potassium nitrite and sulphuric acid on the alcohol. The potassium nitrite may be easily made by maintaining potassium nitrate for some time at a dull red heat. It is then heated with amylic alcohol in a flask on a water bath, and sulphuric acid, diluted with its volume of water, gradually added. Nitrite of amyl distils over regularly with some vapour of water. After washing the product with a solution of potassium carbonate, it is distilled, and all that passes below 100° may be retained.

Perfectly pure nitrite of amyl can only be obtained by many and careful fractionations, and would be too expensive for pharmaceutical use. It boils constantly at 96° , the boiling point given by Balard,

and its vapour is not disassociated at its boiling point. Mr. Tichborne's statement, made some ten years ago and subsequently contradicted by Chapman, that nitrite of amyl is decomposed by boiling, is erroneous. No gas of any description is evolved during the distillation of amyl nitrite, as can be demonstrated by most rigorous experiment.

It might naturally be expected that there would be a diminution of 5 or 6 per cent. of the portion passing between 90° and 100° at each fractionation. Ten degrees is a very considerable range, and the very fact that Mr. Dott could not get all of his nitrite to pass between 90° and 100° , should have indicated to him that his product was not perfectly pure; but it was gradually approaching to purity, as shown by the residue left at 100° .

Much time may be saved in fractionating, especially such substances as nitrite of amyl, which has a high tension of vapour, by the use of the Le Bel and Henninger apparatus, described in the *Comptes Rendus* (lxxiv., 480), as two or three fractionations will then effect an almost perfect separation.

The author has examined specimens of nitrite of amyl from reputable houses, and has found boiling points between 70° and 180° . Such products, it is needless to say, have never been rectified. The whole result of the action has been distilled and bottled as nitrite of amyl. One specimen had not entirely distilled at 220° ; another contained about 10 per cent. of water, 25 per cent. of amyl nitrite (90° to 100° C.), and the remainder was composed almost entirely of unaltered amylic alcohol.

The boiling point of the nitropentane derived from ordinary amylic acid is in the neighbourhood of 160° C. The author has found traces of it in all of the commercial nitrite of amyl he has examined; and sometimes the proportion is not inconsiderable. It may be detected by subjecting that portion which passes between 150° and 170° C. to the action of nascent hydrogen. Amylamine is thus formed. Commercial amyl nitrite seems also to contain very small quantities of nitrate of amyl.

Note on the Detection of Zinc in Toxicological Analyses. M. Chapuis. (*Journ. de Pharm. et de Chim.*, 1878, 379.) If after the destruction of organic matter by means of potassium chlorate and hydrochloric acid the resulting liquid is treated with sulphuretted hydrogen, any zinc present may, contrary to all expectation, pass into the precipitate, especially if, previous to the treatment with H_2S , the liquid is neutralized by ammonia and re-acidified with hydrochloric acid. The precipitation of zinc under these circum-

stances is due to the fact that organic acids (acetic, formic, oxalic) are formed by the action of the potassium chlorate and hydrochloric acid upon the starch and cellulose present. To prevent errors and to guard against the possibility of zinc being overlooked, the author therefore recommends to avoid the ammonia and to make sure of the presence of a sufficient excess of hydrochloric acid before the introduction of sulphuretted hydrogen. If this precaution be not observed, the zinc must be looked for in the precipitate.

The Detection and Estimation of Mineral Oil as an Adulteration in Animal, Vegetable, and Fish Oils. W. Thomson. (*Chem. and Drugg.*, Sept. 1878, from *Proc. Brit. Assoc.*) Admixtures of this kind are often met with and sold as lubricating oil. The author boils some of the sample with an alcoholic solution of caustic soda, which converts all the animal, vegetable, or fish oils into soap. This is then mixed with sand and treated and washed with petroleum spirit, and distilled at a temperature under 190° F., which dissolves out the mineral oil, leaving the soap insoluble. The spirit is then distilled off from the spirit solution of mineral oil at a temperature not exceeding 220° F., and the residue of mineral oil weighed and calculated on the weight of the original mixed oil taken.

The Alkaloid of Mio-Mio (*Baccharis Coridifolia*). P. N. Arata. (*Anuales de la Sociedad Cientifica Argentina*, iv., 34. From *Pharm. Journ.*) The mio-mio (*Baccharis coridifolia*, Lam.) is a composite plant abundant in the Banda Oriental del Uruguay, the Argentine Republic, and Brazil. The notoriety which this plant has acquired in these countries is due to the toxic action which it exercises upon the animal organism, it being the cause of considerable losses of sheep and cattle to the farmers; and it is more dreaded because the animals confound it with the healthy pasture among which it grows. The author reports that he has obtained from this plant an alkaloid in sufficient quantity to allow of the following description:—

The dry powdered plant was boiled with distilled water in a porcelain capsule, and the water separated by decantation, the operation being repeated until the material was completely exhausted. The united liquors were filtered and evaporated, at first over a fire, and afterwards in a water bath, to the consistence of an extract, which was mixed with double its weight of a mixture of caustic lime and magnesia, and the evaporation was then continued to dryness. The product was pulverized and digested for forty-eight hours with amylic alcohol in a closed vessel with frequent agitation,

then thrown on a filter; the filtrate of amylie alcohol upon evaporation left the alkaloid in a crystalline form.

Amylie alcohol is preferable to ether in this operation, as it dissolves the alkaloid very readily, especially with heat, and a saturated solution deposits a very voluminous crystalline mass. Under the microscope the crystals appear as long delicate needles, sometimes united and radiating from a common centre so as to form stars.

Water dissolves the alkaloid sparingly; ether and alcohol dissolve it with more facility, but it is not very soluble in them; the best solvent is amylie alcohol.

Dissolved in water the alkaloid gives neither an alkaline nor an acid reaction, it showing no change of colour with vegetable reagents. It dissolves with greater facility in boiling water to which some drops of acetic acid have been added. The acetate that results is fairly soluble in boiling water, but upon cooling the liquid becomes turbid as if concentrated, the turbidity disappearing upon the addition of more water.

The solution of the acetate gave the following reactions:—With sodium phosphomolybdate or phosphomolybdic acid a greenish yellow precipitate, disappearing when heated and reappearing on cooling; with potassium iodohydrargyrate, a yellowish white precipitate; with the double iodide of cadmium and potassium, a light crystalline precipitate; with potassium platinocyanide, a very marked turbidity; with platinum chloride, a light yellow precipitate, disappearing when heated and reappearing on cooling; with gold chloride or picric acid, a yellowish precipitate; with potassium iodoiodide or sodium phosphoantimoniate, a reddish yellow precipitate; with phosphotungstic acid or mercury bichloride, a white precipitate; with potassium ferrocyanide, an abundant white precipitate; with potassium ferricyanide, a dark green coloration when heated; with sodium nitro-prussiate, a coloration, and with sodium phosphoantimoniate, potassium sulphocyanide, or potassium bichromate, no change. The author considers that the foregoing reactions demonstrate that this substance is an alkaloid, and he has named it "baccarine."

Some physiological experiments made upon a sparrow have proved that baccarine exercises a toxic action; and further investigation in this direction has been undertaken by Prof. Pirovano. The author promises to study the elementary composition of the alkaloid and its salts with a fresh quantity of material.

Determination of Manganese, Nickel, Cobalt, and Zinc, and their Separation from Iron. A. Classen. (*Zeitschr. des oesterr. Apoth.*

Ver., 1879.) The author's method is based on the complete insolubility of the oxalates of manganese, nickel, cobalt, and zinc in strong acetic acid. The concentrated neutral solution containing any of these metals is mixed with solution of neutral potassium oxalate (1 in 6) and strong acetic acid, the mixture heated on a water bath to render the precipitated oxalate dense, and the latter washed on a filter with strong acetic acid, or with a mixture of acetic acid and diluted alcohol. The precipitate is then ignited and weighed as oxide. Acid solutions must first be neutralized with sodium hydrate, and then acidified with oxalic acid. If iron is to be separated from these metals, it must be present entirely as a ferric salt, as in this case only it is completely left in solution. Ferrous iron would be precipitated as oxalate along with the metals named.

Purification of Hydrogen. E. Schobig. (*Journ. für pract. Chem.*, xiv., 289.) The purifying agent employed in the author's experiments is potassium permanganate. The impure hydrogen was passed through a saturated solution of permanganate, and afterwards over a piece of pumice impregnated with the same liquid. Separate series of experiments were made with acid, neutral, and alkaline solutions of the permanganate, and the following results obtained:—

Arseniuretted hydrogen was found to be completely decomposed both by acid and neutral permanganate solution, so that the hydrogen thus purified did not form the slightest deposit when passed through a red hot tube. The arsenic retained by the permanganate was found therein as arsenic, and not a trace of it as arsenious acid.

Antimony was as completely absorbed by the permanganate as arsenic, and subsequently found in it as oxide and as antimonious acid.

The destruction of phosphoretted hydrogen could also be completely effected, either by acid or neutral solution of the permanganate, and its phosphorus retained as phosphoric acid.

Hydrocarbons also were found to be completely destroyed by neutral permanganate solution.

Sulphuretted hydrogen was completely absorbed by alkaline, but only imperfectly by neutral and acid solutions of permanganate.

Hydrogen, largely contaminated with As H_3 , Sb H_3 , and P H_3 (the three impurities being present together), could be completely purified by passing it first through permanganate solution, and then through solution of sodium hydrate. The use of the latter is also

recommended for the complete removal of sulphuretted hydrogen, and for the absorption of the carbonic anhydride resulting from the oxidation of hydrocarbons.

Respecting the action of pure hydrogen on solution of silver nitrate, the author found that even the purest gas effected a distinct reduction.

Purification of Hydrogen. E. Varenne and E. Hebré. (*Bull. Soc. chim. de Paris*, xxviii., 523.) Referring to the foregoing article, the authors consider permanganate too expensive for the purification of large quantities of hydrogen, and recommend in its place a solution of 100 grams of potassium bichromate in 1 litre of water acidified with 50 grams of strong sulphuric acid, which they find to yield equally good results.

Scoparin and Sparteine. E. Merch. (*Heilbronner Memorablen*, 1878, xii. From *Pharm. Journ.*) Increased attention having been recently directed in Germany to the diuretic properties of an old popular remedy, the broom (*Sarothamnus Scoparius*), the author was induced to prepare a quantity of the two bodies, scoparin and sparteine, discovered in the plant by Stenhouse, in 1851, and described by him as its active principles, and to submit them to Dr. Frommüller for therapeutic experiment. The results obtained are embodied in the following:—

Scoparin occurs in the form of a fine yellow powder, in which under the microscope isolated acicular crystals can be seen. It is sparingly soluble in cold water, more freely in boiling water, whilst it dissolves readily in alcohol and glycerin. With alkalies, on account of the weak acid properties of scoparin, no constant neutral compound can be obtained. The best form for its administration is as a subcutaneous injection in doses of 0·03 to 0·06 gram. For this purpose it is dissolved in water either with the aid of an addition of glycerin or a trace of ammonia: 0·03 gram of scoparin, 1 gram of water, and a small addition of ammonia give a suitable solution for one application. For a glycerin solution the proportions are: 0·06 gram scoparin, 0·75 gram water, and 0·25 gram glycerin. The ammoniacal solution causes the least pain.

Whilst the above doses administered subcutaneously produced a strong diuretic action, when administered by the mouth, to produce equal results, the doses require to be increased to 0·5 and even 1·0 gram. This is possibly due to its sparing solubility, and may indicate the necessity of experiments in the direction of an ammoniacal solution for internal administration. No injurious effects upon the digestion have been observed.

The second body, sparteine, occurs in the broom in much smaller and very variable quantities. In the pure condition and freshly prepared it is an almost colourless oily liquid, which when exposed to light and air rapidly becomes coloured yellow to brown. It possesses a peculiar smell, recalling that of hyoseyamine, and a very bitter taste. It has no action on the pupil of the eye. In water it is insoluble, but dissolves in alcohol. It gives the characteristic alkaloid reactions, has strongly basic properties, and forms with acids crystallizable salts readily soluble in water. Of these the author has principally prepared the sulphate, in the form of a white powder showing crystals distinctly under the microscope. There is no difficulty in preparing larger crystals, since the author has obtained them one centimetre in length; but he considers the small crystalline form presents advantages in the preparation of a pure compound in dispensing. The crystals belong, so far as can be determined, to the monoclinic system. The pure sparteine being, as above mentioned, a very sensitive and alterable body, the author thinks the sulphate will be found more suitable for administration, its ready solubility in water also favouring its subcutaneous injection.

Although the experiments with this salt have not been numerous, they have shown that neither its internal nor subcutaneous administration produce unpleasant accidents or smarting, whilst its diuretic action was considerable. An aqueous solution was used, of the strength of 1 part of sulphate of sparteine to 50 of water; and of this the internal dose was 30 drops (= 0.04 gram of the salt), and the subcutaneous 1 gram (= 0.02 gram).

Preparation of Pure Mercurous Iodide. P. Yvon. (*Journ. de Pharm. et de Chim.*, 1879, 244.) The author recommends a wet process based on the observation that glycerin prevents the decomposing action of water on mercurous solutions. He gives the following directions:—

Dissolve 25 grams of crystallized mercurous nitrate in 60 grams of pure glycerin, dilute with 300 grams of water, and filter. Then pour into this solution another containing 16.6 grams of iodide of potassium in 50 grams of distilled water. Allow the precipitate to settle, wash by frequent decantation, then place on a filter, and continue washing until a drop of the filtrate ceases to leave a residue when evaporated on platinum foil. The product is of a fine yellowish green colour. The solution of iodide of potassium must be poured, slowly and under constant stirring, into that of the mercurous nitrate, and not the latter into the former. The solution

of iodide of potassium must not be alkaline, and should it be so, must be made neutral or very faintly acid by means of acetic acid.

Determination of Sulphites and Hyposulphites. Dr. J. Grossmann. (*Zeitschr. für analyt. Chem.*, 1879, 79.) A part of the solution containing both sulphite and hyposulphite is titrated with iodine in the presence of acetic acid, while in another part complete oxidation is effected by means of chlorine or bromine, and the resulting sulphate estimated by barium chloride. From the numbers obtained, the quantities of sulphite and hyposulphite are calculated by two equations, as in other instances of indirect analysis.

Analysis of Mixtures of Chromates and Free Chromic Acid. E. Donath. (*Zeitschr. für analyt. Chem.*, 1879, 78.) A monochromate is detected in the presence of a bichromate by adding to a few c.c. of the concentrated boiling solution a drop of a neutral solution of manganous sulphate, whereupon, in the presence of monochromate, a heavy, crystalline, blackish brown precipitate is formed. Bichromate is detected in the presence of monochromate by the formation of a brown precipitate or turbidity of chromium peroxide on adding a portion of the original solution, heated to the boiling point, to an equal volume of a boiling solution of sodium hyposulphite. Free chromic acid may be detected in the presence of a bichromate by its power of liberating iodine from potassium iodide. To render this test very delicate, the liberated iodine may be shaken out with carbon bisulphide or chloroform.

Composition of the Milk of the Cow Tree (*Brosimum galactodendron*). M. Boussingault. (*Comptes Rendus*, lxxxvii., 277. From *Pharm. Journ.*) At a recent meeting of the French Academy of Sciences, the author gave some information respecting this remarkable tree and the liquid which it yields. He first made his acquaintance with "the milk" some years since, whilst engaged in making astronomical observations at the little town of Maracay, in Venezuela, near Lake Tacarigua, where the natives brought in supplies daily to be consumed with coffee or chocolate. He afterwards saw the tree growing abundantly in a forest mentioned by Humboldt, near the rapids of Naguanagua, in the neighbourhood of New Valentia.

The liquid, which is obtained by making an incision in the trunk of the tree, is white and viscous, having more consistence than cow's milk, and a slightly acid reaction; when exposed to the air it turns sour and deposits a voluminous coagulum of caseous matter. During the author's stay at Maracay he made some incomplete experiments with the milk, and found in it the following

constituents:—(1) A fatty substance resembling beeswax, fusible at 50° C., partly saponifiable, very soluble in ether, slightly soluble in boiling alcohol. This was probably a mixture of several substances, and acquired after melting and cooling the appearance of virgin wax. It was used to make candles. (2) A nitrogenous substance analogous in its fibrous construction to casein, and recalling the vegetable fibrin observed by Vauquelin in the juice of *Carica papaya*. (3) Saccharine matters, the nature of which was not further determined. (4) Salts of potash, lime, and magnesia, including phosphates. The quantity of fixed matters were estimated at 40 per cent. of the milk.

Recently the author has had the opportunity of making a more thorough examination of some "milk" sent in bottles to the French Exhibition by the Venezuelan Government. In 100 parts of extract of the milky juice, obtained in conditions where it had not undergone fermentation, were found:—

Wax, Fatty Matters	84.10
Inverted Sugar	2.00
Non-invertible Sugar	1.40
Gum, easily saccharifiable	3.15
Casein and Albumen	4.00
Alkaline Ash and Phosphates	1.10
Undetermined non-nitrogenous Substances	4.25
	<hr/>
	100.00

Calculated to 100 parts of juice, containing 42 parts of fixed matter, there were:—

Wax and saponifiable Matters	35.2
Saccharine and analogous Substances	2.8
Casein and Albumen	1.7
Alkaline Earths and Phosphates	0.5
Undetermined Substances	1.8
Water	58.0
	<hr/>
	100.0

The vegetable approaches cow's milk in its composition, in that it contains a fatty body, saccharine matters, casein, albumen, and phosphates. But these substances are present in very different proportions; the total amount of fixed substances is three times larger than in cow's milk. In fact, the vegetable milk is comparable rather to cream, as is shown by the following, representing an analysis of fresh cream by Jeannier:—

Butter	34.3
Milk Sugar	4.0
Casein and Phosphates	3.5
Water	58.2

 100.0

Thus the butter in cream is present in nearly the same proportion as the waxy matter in the milk of *Brosimum galactodendron*. This analogy explains the nutritive value attributed to the vegetable milk, or rather cream, since, according to Claude Bernard, fatty matters susceptible of being split up into acids and glycerin are assimilable.

Solanine and its Decomposition Products. A. Hilger. (*Liebig's Annalen*, excv., 317.) According to the author's analyses, the correct formula of solanine is $C_{42}H_{75}NO_{15}$, and that of solanidine $C_{26}H_{41}NO_2$. For the acetyl derivatives of solanine and solanidine he gives the formulæ,—



Solubility of Cadmium Sulphide in Ammonium Sulphide. A. Ditte. (*Comptes Rendus*, lxxxv., 402.) The author shows that freshly precipitated cadmium sulphide is appreciably soluble in ammonium sulphide, and therefore the usual mode of separating it from the sulphides of mercury, lead, bismuth, etc., is far from being so satisfactory as it is generally supposed to be. He prefers sodium or potassium sulphide for the separation, as in these the cadmium sulphide is much less soluble.

Composition of Hunyadi Janos Mineral Water. Prof. Fresenius. (*Zeitschr. für analyt. Chem.*, 1878, 461.) According to the author's recent analysis, the water of the spring has the following composition:—

In 1000 Parts.

Sodium Sulphate	19.662
Magnesium Sulphate	18.450
Calcium Sulphate	1.322
Potassium Sulphate	0.133
Sodium Chloride	1.424
Magnesium Bicarbonate	0.731
Ferrous Bicarbonate	0.002
Silicic Acid	0.011
Free Carbonic Acid	0.01268

Traces of lithium, strontium, phosphoric acid, nitric acid, boric acid, iodine, bromine, and organic matter.

The carbonates are calculated as neutral carbonates, and all salts as free from water of crystallization.

MATERIA MEDICA.

PART II.

MATERIA MEDICA.

Japanese Cinnamon. Dr. G. Martin. (*Archiv der Pharm.*, cxxiii., 337.) The cinnamon reported upon by the author was obtained from the island of Sikok, and was probably the produce of *Cinnamomum Loureiri*. 10 pounds of this bark yielded upon distillation with high pressure steam about 40 grams of a pale yellowish, almost colourless oil, lighter than water, and having an odour somewhat resembling that of a mixture of camphor and Ceylon cinnamon. In its chemical properties this oil differs essentially both from the oils of cinnamon and of cassia. Concentrated sulphuric acid imparts to it a violet-red colour, changing to indigo-blue, then to a magnificent green, and finally to brown. If water be added while the mixture is blue, the change to green likewise occurs, but by degrees a resinous body separates, which is insoluble in water and alcohol, but perfectly soluble in ether, forming with the latter a greenish yellow solution which leaves a green resin on evaporation. With concentrated nitric acid the oil does not yield crystals of nitrobenzoic acid, but forms a wax-like solid which fuses to an oily liquid upon warming.

The rotatory power of the oil, as determined by Wild's polaristrometer, is $+4^{\circ}$. Treatment with solid caustic soda removes the cinnamon odour and develops more plainly that of camphor. When heated with an aqueous solution of permanganate, a distinct odour of oil of bitter almonds is evolved.

Crossopteria Kotschyana, s. Febrifuga. Dr. O. Hesse. (*Ber. der deutsch. chem.-Ges.*, xi., 1546.) The bark of this Abyssinian plant, belonging to the Order *Rubiaceæ*, contains an alkaloid named by the author *crossopteryne*. It is soluble in alcohol, ether, and dilute acids. 20 grams of the bark yielded .0036 gram of the alkaloid.

Analysis of Rhubarb. H. G. Greenish. (*Pharm. Journ.*, ix., 3rd series, 933.) The analyses of the following four samples of rhubarb were made with a view of ascertaining, for the purpose of comparison, the quantities of the various constituents, active or otherwise. The method adopted was similar to, though not identical with, that adopted by Prof. Dragendorff (see *Pharm. Journ.*, viii., 826, and *Year-Book of Pharmacy*, 1878, 52).

1. *Rheum Chinense*.—Commercial rhubarb. Forwarded to the

Dorpat Institute from the Pharmaceutische Handelsgesellschaft, in Petersburg, as a fine sample.

2. *Rheum Sibiricum*.—Young roots collected by Dr. Duhmberg, of Barnoul, in the Sajau Gebirge.

3. *Rheum Mandshuricum*.—Sent as a sample to the Pharmaceutische Handelsgesellschaft, in St. Petersburg. Large, somewhat spongy masses, apparently from very old plants. Partly unsound in the centre. The author's sample was taken from a sound piece.

4. *Rheum Palmatum*.—The fresh root, of four to five years' growth, was sent from the St. Petersburg Botanical Garden to the Dorpat Pharmaceutical Institute for examination.

Full details are given in the original paper of the processes of analysis.

In the following table are given the results of the analyses in percentages:—

	Rheum Chinense. No. 1.	Rheum Sibiri- cum. No. 2.	Rheum Mand- shuricum. No. 3.	Rheum Palma- tum. No. 4.
Moisture	10.04	10.24	6.63	9.02
Ash (free from CO_2).	8.06	2.84	15.23	4.54
Mucilage (soluble in water).	1.72	2.75	0.85	2.40
Arabic Acid (?).	3.59	4.10	2.45	3.69
Metarabic Acid.	2.38	3.34	1.12	5.86
Pararabin (?).	3.18	0.26	6.17	1.79
Starch (saccharifiable by Diastase).	3.69	6.92	0.26	11.98
Cellulose.	4.20	8.25	3.05	3.25
Sugar.	2.34	8.28	3.60	2.78
Substance Soluble in Water and Alcohol.	13.61	5.61	5.66	4.68
Cathartic Acid.	4.96	1.70	0.70	?
Mucilaginous Matter precipitated in the place of Cathartic Acid.	—	—	—	4.75
Malic Acid (etc.).	2.28	2.28	0.48	0.65
Oxalic Acid.	7.87	0.34	27.30	0.84
Free Chrysophanic Acid, soluble in Petro- leum Ether.	More than traces.	1.45	absent.	trace.
Chrysophan and Tannin.	9.58	5.03	9.75	7.95
Resinous Substances soluble in Ether.	0.75	0.90	1.25	0.25
Resinous Substances soluble in Alcohol (Emodin, Erythrorotin, Phæoretin).	2.74	10.15	2.38	2.70
Fatty Substance.	0.50	—	trace.	0.37
Proteinaceous Substances.	6.65	6.90	3.74	11.50
Total	88.44	81.34	90.62	79.00
Paracellulose, Vasculose, Pectose, Lignin, etc., and Loss.	11.56	18.66	9.38	21.00
	100.00	100.00	100.00	100.00

A comparison of these results with the analyses of Prof. Dragendorff, previously referred to, shows,—

I. In *Rheum chinense*, in regard to active principles (cathartic acid, chrysophan, tannin, etc.), a very satisfactory agreement.

II. In *Rheum sibiricum* agreement in the peculiarity of this root, previously pointed out by Prof. Dragendorff, viz., the large amount of free chrysophanic acid.

III. In regard to *Rheum mandshuricum*, that this is an inferior rhubarb, the introduction of which into Europe can only be sanctioned as a speculation on its richness in chrysophan and tannin, etc.

IV. It would tend to show, in regard to *Rheum palmatum*, either that this plant forms the most important therapeutic constituents only in a more advanced state of growth, or that in the St. Petersburg climate it is incapable of so-doing. The sample examined characterizes itself as a young root by the large amount of proteinaceous, amylaceous, and mucilaginous substances it contains.

It only remains for the author to express his sincerest thanks to Prof. Dragendorff for the unfailing interest taken in this investigation.

The Volatile Oil of Eucalyptus. (*Zeitschr. des oesterr. Apoth. Ver.*, 1878, 402; and *Pharm. Zeitung*, 1879, 220.) The distillation with water of the leaves and young twigs of different species of *Eucalyptus* yields a number of essential oils which often differ materially in their physical characters. The following are the principal species from which the oil is prepared:—

Eucalyptus amygdalina.—The oil from this species is pale yellow and thin, and has a pungent odour, slightly resembling that of oil of lemon, but not so delicate. Its taste is mild and cooling, afterwards bitter. It boils at 165°–188° C., and at –18° C. deposits a stearoptin, which melts at –3°. The oil resinifies on exposure to the air. Its sp. gr. at 15° C. is .881.

E. oleosa.—Oil thin, mobile, pale yellow; of a mild camphoraceous taste, faintly resembling oil of turpentine. Odour mint-like. Sp. gr. 0.911. Boils at 161°–177° C.

E. sideroxydon.—Oil very pale yellow, thin. Odour and taste like preceding. Sp. gr. .923. Boils at 161°–177° C.

E. goniocalyx.—Oil pale yellow, of penetrating, pungent, unpleasant odour. Taste very disagreeable. Sp. gr. .918. Boils at 152°–175° C.

E. globulus.—Oil thin, very pale yellow. Odour like oil of caju-

put, but less agreeable. Taste cooling, mint-like. Sp. gr. .917. Boils at 149°–177° C.

E. corymbosa.—Oil colourless, odour faintly lemon and rose-like, taste feebly bitter, slightly camphoraceous. Sp. gr. .881.

E. obliqua.—Oil reddish yellow, odour mild, taste bitter. Sp. gr. .899. Boils at 171°–195° C. Becomes cloudy at –18° C.

E. fissilis.—Oil pale reddish yellow. Odour like preceding. Sp. gr. .903. Boils at 177°–196° C.

E. odorata.—Oil pale yellowish, with a greenish hue. Odour aromatic. Sp. gr. .899–.922. Boils at 157°–199° C.

E. longifolia.—Of oily consistence. Taste aromatic and cooling. Odour strong, camphoraceous. Boils at 194°–215° C., and has a sp. gr. of .940.

E. rostrata.—Oil pale yellow to amber. Odour and taste like that of *E. odorata*. Sp. gr. .918. Boils at 131°–181° C.

E. viminalis.—Oil pale yellowish green. Odour disagreeable, but not strong. Sp. gr. .921. Boils at 159°–182° C.

All these oils are now prepared on a large scale, and form important articles of commerce. The one most commonly met with is that of *E. amygdalina*, which contains more oil than any known species. Its oil much resembles that of *E. globulus*, but possesses less therapeutical efficacy than the latter. The oil of *E. globulus*, which is obtained in the proportion of six ounces per 100 pounds of leaves, is the only one used for the preparation of eucalyptol.

Analysis of Cinchona Barks from Columbia. J. E. Howard. (*Pharm. Journ.*, 3rd series, ix., 140.) The following analyses were forwarded by the author to the Secretary of State for India. They refer to barks brought home from Columbia by Mr. Robert Cross:—

Description of Barks submitted to Analysis.

"A. No. 1. 'Calisaya of Santa Fé.'—Best soft Columbian. Collected October, 1877. Caqueta River; elevation, 7,800 feet. This bark was actually taken from the rejected cane-like shoots cut from the plants brought home.

"B. No. 1. 'Hard Carthagena.'—Paniquita variety, Popayan. Collected October 23, 1877; elevation, 5000 feet, valley of the Cauca.

"No. 2. 'Hard Carthagena.'—Paniquita variety. Collected December 8, 1877. Usenda; elevation, 8,500 feet, district of the Cauca.

"No. 3. 'Hard Carthagena.'—Smooth-leaved variety. Col-

lected December 27, 1877. Pueblo Nuevo; elevation, 8,000 feet, district of the Cauca.

"No. 4. 'Hard Carthagera.'—Paniquita variety. Collected January 18, 1878. Silvia; elevation, 7,500 feet, district of the Cauca.

"No. 5. 'Hard Carthagera.'—Magdalena variety. Collected Jan. 14, 1878. Coralís Inza; elevation, 7,000 feet, district of the Magdalena.

"No. 6. 'Hard Carthagera.'—Paniquita variety. Collected January 23, 1878; elevation, 6,000 feet, district of the Cauca."

Results of Analyses.

	A 1	B 1	B 2	B 3	B 4	B 5	B 6
Quinine Alkaloid . . .	3.25	.00	.00	See Footnote *	.00	1.88	.00
Cinchonidine ditto . . .	1.90	.00	.46		.28	1.18	.00
Quinidine ditto . . .	.04	.00	.00		.00	.18	.00
Cinchonine ditto . . .	.30	1.23	1.25		1.30	.80	1.24
Amorphous ditto . . .	.75	1.68	1.97		2.18	.71	1.48
Total Alkaloid . . .	6.24	2.91	3.68		3.76	4.75	2.72
<i>As Sulphates.</i>							
Quinine Sulphate . . .	4.20	.00	.00	See Footnote *	.00	2.50	.00
Cinchonidine ditto . . .	2.53	.00	.75		.37	1.55	.00
Quinidine ditto . . .	.05	.00	.00		.00	.24	.00
Cinchonine ditto . . .	.40	1.64	1.66		1.73	1.07	1.65
Crystallizable Sulphates	7.18	1.64	2.41		2.10	5.36	1.65

Apart from No. 1, which promises to be a great success, the only kind worthy of cultivation is the No. 5, marked 'Coralís Inza,' which is a fine grower, and, in the author's opinion, well worth naturalizing in India. This bark has met with a ready sale in commerce.

The Relations between the Active Principles and Botanical Characters of Official Plants. Prof. A. Herlandt. (*Archiv der Pharm.*, July, 1878.) In a lengthy paper the author discusses the following question: Are the relations existing between the properties and the physical characters of plants, as observed since the earliest botanical studies, merely coincidental, or are they governed by the laws of natural affinity, which endeavour to systematically associate all living being? He arrives at the following conclusions:—

1. Botanic species and families which are similar in their cha-

* This smooth-leaved variety is evidently (by the bark) the *Quina blanca* of Carthagera. It does not belong to the cinchona, but to an allied family of plants. It was twice examined, and contains 0.44 of alkaloid of unascertained properties, the quantity being insufficient for examination of probably a new alkaloid.

acters are also similar in the nature and properties of their constituents.

2. The species which form the connecting link between similar groups contain constituents belonging to the allied families.

3. The botanic and natural classification of the medicaments of vegetable origin is the only scientific and rational one.

Italian Olive Oil. A. Jansen. (*Chem. and Drugg.*, 1879, 145; from *Pharmaceut. Zeitung*.) The so-called "virgin oil" is obtained by gentle pressure from the pericarp of the fruit; it is amber-yellow to yellowish green in colour, of a pleasant flavour, and with a slight odour of the olive. After expression the oil is at first turbid, but after a little time it becomes quite transparent. Alcohol and ether will dissolve about 3-1000th of their volume. It will keep in a cool place for a long time without change. It boils at 330° C., and its sp. gr. at 12° C. is .9192.

The Tuscan oil, and especially that from Lucca, is generally considered the finest for eating. The average annual production throughout the whole of Italy is reckoned at 1,700,000 hectolitres, worth about 350 millions of francs, and this value might be increased if the preparation were conducted with greater care. Sicily, for instance, produces 190,000 quintals, of which not more than 10,000 quintals can be sold for eating purposes. In some provinces the oil produced is so carelessly prepared that it is worthless, except for lamps and for the manufacture of soap. A good oil is prepared on the Ligurian coast, the greater part of which is exported to France, and there refined and sold at a very high price as Provence oil. In recent years the province of Bari has made remarkable progress in the preparation of the oil; and now the Bari oil ranks almost, if not quite, equal with the Lucca oil, as the finest of the Italian olive oils.

Next to the virgin or superfine oils, which are used for eating, preserving sardines, etc., comes a second quality, which is obtained by a second pressing; then a third quality, obtained by hot pressure and water, and used for lamps; and a fourth quality, extracted by sulphide of carbon or benzine, and used in the manufacture of soap, for cart grease, and so on.

The first purification of the expressed oil is performed by letting it stand for four to six days in large earthen vessels, holding three or four hectolitres, in order that the impurities may settle. If this method does not clear the oil, it is necessary to filter it. It is found best before filtration to mix the oil with a twentieth part of its volume of water, as by this means the slimy substances are more

readily removed. When the oil is very dirty, it is advantageous to dissolve some tannin in the water before mixing with the oil. Small quantities are filtered through paper, but for large quantities cotton is used. Filtration is also recommended through a bed of sand, wood charcoal, and sulphate of lime.

Dark coloured oils are chemically purified either by acids (nitric or sulphuric) or by alkalies (ammonia, soda, or potash). The acid process is a good one, but if too much or too little is used the oil is injured. A safer method is to purify by ammonia, the process of which is to add to 100 kilograms of oil in a cask 400 grams of ammonia diluted with 800 grams of water. These are agitated together, and the oil is allowed to stand for three days, and is then decanted and filtered.

Other methods of decolorizing the oil are adopted. Sometimes it is exposed to sunlight in large white glass bottles. The oil soon becomes colourless, but acquires a bad, almost rancid taste. Agitation with a solution of permanganate of potash (2 per cent.) will also bleach the oil, but this method also leaves a disagreeable taste. A somewhat complicated method, but one which gives a good result, is first to agitate the oil in a cask with water containing gum; then to add to the emulsion thus formed coarsely crushed wood charcoal. The whole is then slowly warmed, but not so high as 100° C., and when cold treated with ether to separate the oil. The ether is recovered by distillation. A stream of nitrous acid gas is sometimes passed through coloured oil, and this process is much recommended. Kaolin is also used by some manufacturers (oil 500, water 50, kaolin 50). Very common oil is sometimes decolorized by agitation with a solution of acetate of lead, addition of sulphuric acid, and subsequent washing with warm water.

Several methods are employed to restore an olive oil which has become rancid. One is to agitate twenty-five parts of oil with five parts of good vinegar, repeating the operation several times. Or fifty parts of oil are agitated with eighty parts of water at 30° C., in which twelve parts of common salt have been dissolved; the operation is repeated five or six times. The best method, however, is to add 2 kilograms of calcined magnesia to 100 litres of rancid oil, and for six days the mixture should be agitated four times a day for at least a quarter of an hour each time. Then the oil is filtered. Such oil must be quickly used, or it will soon become rancid again.

Cod Liver Oil. Prof. J. Husemann. (*Zeitschr. des oesterr. Apoth. Ver.*, Aug. 20, 1878, 386.) The author denies the exist-

ence in cod liver oil of any special active principle, and attributes its therapeutic properties entirely to the mixture of the glycerides of fatty acids contained therein, which he believes are more readily absorbed and more quickly oxidized in the organism than other oils and fats. He gives decided preference to the white oil made by heating the fresh and well-washed liver in tinned vessels by steam, then decanting, straining, exposing to a low temperature to separate the stearine, and again decanting or filtering. Such an oil when carefully bottled and sealed will keep for many years without change.

Adulterated Kamala. A. Kremel. (*Zeitschr. des oesterr. Apoth. Ver.*, 1878, 525.) The author records two cases of gross adulteration of this drug. One of these samples was a reddish brown, heavy powder, which, when examined under the microscope, showed barely any kamala glands, but appeared to consist mainly of reddish brown, transparent masses, intermixed with white crystalline and amorphous particles. Its behaviour to alcohol, solution of potash, and hydrochloric acid was essentially different from that of genuine kamala. The ash left upon incineration amounted to as much as 79·5 per cent. A qualitative analysis proved the main constituent of the sample to be red bole.

The second specimen was a reddish brown, hygroscopic, light powder, of a strong peculiar odour. It contained 11·8 per cent. of water, and left 9·7 per cent. of ash. The microscope examination showed this sample to consist almost entirely of the dried and powdered flowers of *Carthamus tinctorius*, partly destroyed by insects and mixed with them.

A number of other samples of kamala obtained in Vienna were also examined by the author, and the majority of them found to be pure. The water in these varied from 2·7 to 4·2 per cent., and the ash from 8·4 to 22·8 per cent.

Sparattosperma Leucantha, Mart. (*Bignonia Leucantha*, Velloz.) Dr. T. Peckholt. (*Zeitschr. des oesterr. Apoth. Ver.*, Aug. 10, 1879, 362.) This tree belongs to the Natural Order *Bignoniaceae*, and is indigenous to Brazil, where it is commonly known by the name *cynco-folhas*. It is described by the author as a tall tree, losing its foliage in July, and regaining it in November, and bearing delicate white flowers gradually assuming a slight violet tinge. The fruit ripens in February, and consists of pods of the thickness of a finger, and about 30 to 40 centimetres in length. The leaves are used medicinally in the form of an infusion, and are highly spoken of as a curative agent in disorders of the liver and kidneys. Their

efficacy is attributed to sparattospermine, a principle the composition of which is represented by the formula $C_{19}H_{24}O_{10}$. It is odourless, has a bitter alkaline taste, and turns yellow on the addition of sulphuric acid. It is obtained by extracting the leaves or twigs with water, boiling, refiltering, evaporating to the consistence of an extract, treating this repeatedly with boiling alcohol (sp. gr. 0·833), evaporating the alcoholic solution to dryness, treating this residue with cold water, and purifying the crystalline powder by recrystallizing from boiling alcohol.

Sparattospermine is not a glucoside.

The author's analysis of the fresh leaves proved 1 kilogram of the latter to contain :—

Moisture	640·020
Greenish-brown acid Resin	36·770
Resinoid Matter	} 100·000
Chlorophyll	
Pectic Substances	
Albumen	5·960
Sparattospermin	28·816
Extractive Matter	25·570
Extract, etc.	40·200
Fibrin	89·544
Mineral Salts	33·090

Tannin was found to be absent.

100 grams of the fresh leaves yielded :—

Extractum aquosum	16 per cent.
Extractum spirituosum	6 „ „

100 grams of dried leaves yielded :—

Extractum aquosum	22 per cent.
Extractum spirituosum.	9 „ „
Sparattospermin	2·6000 grams.

100 grams of fresh twigs yielded :—

Sparattospermin	0·0325 „
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100 grams of leaves yielded :—

Sparattospermin	2·884 „
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In a former communication the author used the term *bignoinin* for the active principle; but this appellation he has now given up in favour of the name “sparattospermin.”

A New Constituent of Kino. C. Etti. (*Ber. der deutsch. chem.-Ges.*, xi., 1878.) Kinoin, the new constituent of Malabar kino

isolated by the author, may be prepared from it by extraction with ether, but better and more economically by the following process : One part of kino is added to two parts of boiling dilute hydrochloric acid (1 to 5); kino-red immediately separates as a soft mass, becoming gradually solid on cooling, while kinoin, with a small quantity of colouring matter, remains in solution. The insoluble kino-red is boiled with water to extract any kinoin still present in it; the decoction, united with the acid solution previously obtained, and the whole shaken with ether, which takes up the kinoin, and leaves it on evaporation as a crystalline reddish mass. By repeated recrystallization from boiling water it is obtained in colourless crystals, the composition of which is represented by the formula $C_{14}H_{12}O_6$. One kilogram of kino yielded 15 grams of pure kinoin.

The Mineral Constituents of Horseradish. A. Hilger. (*Chem. Centralbl.*, Sept. 18, 1878.) The author has analysed the ash of the root of *Cochlearia armoracia*, and found it to contain in 100 parts :—

Lime	10.57
Magnesia	3.91
Soda	0.21
Potash	41.47
Oxide of Iron	0.95
Hydrochloric Acid	1.15
Sulphuric Acid	16.49
Carbonic Acid	11.62
Phosphoric Acid	11.52
Silicic Acid	1.48

Bidara Laut. H. G. Greenish. (*Pharm. Journ.*, 3rd series, ix., 1013.) Bidara Laut has been the subject of several communications to the *Pharmaceutisch Weekblad* during the past two years. In a critique on the "Plantkundig Woordenboek voor Nederlandsch Indië," which appeared in the issue of that journal for January 14, 1877, the botanical source of Bidara Laut is referred to a species of *Sisypilus*, of the natural order Rhamnaceæ, plants of which order are characterized by their tonic properties. Dr. E. A. Van der Burg, who found the wood to contain much brucine, but not a trace of strychnine, considers *Strychnos Ligustrina* as its botanical source, while another correspondent of the journal already named refers it to *Eurycoma longifolia*, a Simarubaceous plant. Messrs. Watez and Bakhoven confirm the presence of brucine and the absence of strychnine in the wood; but according to Mr. Vrijdag Zijnen, junr., some sorts contain also a small quantity of strychnine.

Bidara Laut is largely used in India as a popular remedy for dysentery, the people being in the habit, according to Mr. Vrijdag Zijnen, of scraping a spoonful and taking it in a glass of water.

A short time ago the author had an opportunity of making an analysis of a sample of this drug obtained from Mr. Vrijdag Zijnen, the results of which form the main subject of this paper. The sample consisted of part of the trunk or branch of a small tree, about $2\frac{1}{2}$ inches in diameter, with small eccentric pith, exceedingly hard wood, and thin dark grey bark, in some places exfoliating, but in others adhering to the wood with considerable tenacity.

Professor Russow, of the University of Dorpat, undertook the microscopical examination with a view of ascertaining the botanical source of the wood. From him the author learns that the development of phleom in the pith, well shown in the "Bidara Laut," is a peculiar characteristic of plants belonging to the group Contortæ, which includes the Orders Gentianaceæ, Loganiaceæ, Apocynaceæ, and Asclepiadaceæ. The size of the sample, Bidara Laut, however, excludes Gentianaceæ and Asclepiadaceæ, which Orders produce herbaceous or at most shrubby plants. The presence of brucine and the absence of laticiferous tissue prove without doubt that the plant yielding Bidara Laut belongs to the Natural Order Loganiaceæ, and the suppositions previously quoted that the source of the wood was a Rhamnaceous or Sinarubaceous plant are incorrect.

Mr. Greenish's analysis of the drug for strychnine and brucine were carried out as follows:—

4.6 grams of the bark, carefully separated from the hard wood and powdered, were macerated in 100 c.c. of water acidulated with 20 drops of dilute sulphuric acid (1 in 5) at a temperature of about 50°–60° C. for twenty-four hours, and the fluid then filtered off; the maceration was repeated for a shorter period of four hours and again filtered, and the filtrates and wash-water united. This liquid, amounting in all to about 250 c.c., was shaken with freshly rectified benzin (about 50 c.c.), and after the mixture had separated into two layers, the lower aqueous still acid layer was removed, made alkaline with ammonia, and again shaken with benzin. This benzin solution, after separation and filtration yielded on evaporation in watch glasses, alkaloid in considerable quantity, in very nearly colourless amorphous transparent drops, perfectly soluble in acidulated water. A portion of the alkaloid was dissolved in monohydrated sulphuric acid, a small quantity of nitric acid added, when the characteristic brucine reaction made its appearance. After the orange colour so produced had faded to a pale yellow, the strychnine

was tested for by means of oxide of cerium (Ce_3O_4). No trace could be found. The experiment was repeated with like result. A control experiment with commercial brucine impure from the presence of strychnine yielded at once a splendid strychnine reaction. All brucine reactions succeeded perfectly.

The wood was tested in a precisely similar manner with similar results. The quantity of alkaloid present, however, was notably less.

The quantity of brucine in the bark appearing considerable, it was thought an estimation of the amount present in it and in the wood might prove interesting. This was made as follows:—

2.0463 grams of the scraped and finely powdered wood were boiled with successive portions of water acidulated with sulphuric acid until the residue was free from bitterness. This was effected by three boilings with 75 c.c. and one with 25 c.c. The united filtrates were nearly neutralized with solution of soda and evaporated on a water bath to a small bulk (25 c.c.). The liquid having deposited resinous matter, it was filtered off, and the precipitate washed till free from alkaloid. The liquid being still slightly acid, the estimation was made by means of titration by Mayer's solution (potassiomericuric iodide), 1 c.c. of which corresponds to 0.0197 gram of anhydrous brucine. (Dragendorff, *Chemische Werthbestimmung*.) 2 c.c. of the solution were required, indicating 0.04334 gram of brucine, or 2.11 per cent. An estimation of the moisture in the wood showed 6.67 per cent. The percentage of anhydrous brucine present in the dry wood is, therefore, 2.26.

The estimation of the alkaloid in the bark was made in the same manner, and with the following results:—

Brucine, 6.56 per cent.; moisture, 11.23 per cent. The percentage of anhydrous brucine in the dry bark, therefore, amounts to as much as 7.38 per cent.

The author thinks that the quantity of brucine present in the wood and bark, and the total absence of strychnine, may render this drug a valuable source of pure brucine.

The author has also examined in a similar manner the wood and bark of *Strychnos Colubrinum*. The qualitative analysis of these showed the presence of brucine and strychnine, the reaction of the latter being especially well marked in the alkaloid from the bark.

The quantitative analysis gave:—

In the wood, moisture, 9.02 per cent.; alkaloid in dry wood, 0.96 per cent.

In the bark, moisture, 9.19 per cent.; alkaloid in dry bark, 5.54.

Two samples of the bark of *Strychnos Nux Vomica*, formerly known as false angostura bark were also examined. They yielded respectively :—

Young bark, moisture, 7.79 per cent; alkaloid in dry bark (calculated to anhydrous brucine), 3.10 per cent.

Old bark, moisture, 7.83 per cent.; alkaloid in dry bark, 1.68 per cent.

Silphium Lacinatum. Dr. A. J. M. Goss. (*Druggists' Circular and Chem. Gaz.*, June, 1878.) *Silphium lacinatum* grows on the open prairies of Illinois and Wisconsin, and southward and westward, and flowers in July. It is said that the lower leaves (cup shaped) present their edges uniformly north and south. It is a rough and bristly plant, with a stout stem, pinnate leaves, petiolate and clasping at the base. The heads are racemed and few. It contains a balsamic and resinous juice, which, when dry, resembles resin, hence called *resin weed*. The *Silphium perfoliatum*—Indian cup-plant—is a large, perennial, rooted plant, with smooth herbaceous stem, from four to seven feet high, bearing yellowish flowers, and an ovate winged achenium. It grows in the western States in rich bottoms, flowering in August. The root is long, large, crooked, and contains a bitterish gum. It is the part used as medicine. These are the two species used.

Medicinal Properties.—The *Silphium lacinatum* has proved a valuable remedy for many diseases of the mucous membranes, as it has a direct affinity (like the balsams, turpentine, and cubebs) for the mucous tissues. In catarrh and chronic bronchitis it has a fine effect, allaying the irritation in bronchial inflammation, lessening the frequency of the cough, and checking the excessive expectoration. In catarrh it relieves the mucous irritation, and aids other remedies in the final cure. But it is in asthma that the author finds its curative effects most marked, especially when combined or alternated with *Ptelia trifoliata*. He relates a number of cases proving its efficacy in this disorder.

Blatta Orientalis. (*Pharmaceut. Centralh.*, 1878, No. 30, 279.) *Blatta orientalis*, the brownish black cockroach (Order, Orthoptera) has long been known among the domestic remedies of Russia as a valuable diuretic, and is now frequently prescribed there by medical practitioners for dropsical affections. It is given in doses of from 1 to 5 decigrams in powder, or in the form of a tincture or cold infusion.

Tinctura Blattæ orientalis is made by digesting 1 part of the coarsely powdered insect with 5 parts by weight of proof spirit.

The powder must be kept in a bottle with a tight-fitting stopper.

According to Bogomolow these insects contain a crystalline principle named antihydropin or taracanin (see *Year-Book of Pharmacy*, 1878, p. 352).

Spurious Angostura Barks. MM. Oberlin and Schlagdenhauffen. (*Pharm. Zeitung*, 1878, 853.) The authors give the following distinguishing features of true angostura bark and other barks used as adulterants and substitutes:—

1. *Genuine Angostura Bark* is found in the market in either nearly flat, slightly curved, or quilled pieces, pared towards the edges, 2 or 3 millimeters (about $\frac{1}{8}$ inch) in thickness; differing in length and possessing a characteristic odour and a bitter taste. The pieces swell to two or three times their original size when macerated in water, becoming soft and easily divided in a longitudinal direction; when dry, the bark has a short resinous fracture, and a greyish yellow or dirty white, more or less spongy or compact outer surface; while the inner bark is pale yellow, smooth or longitudinally striate.

2. *Nur Vomica Bark*, known as *False Angostura Bark*.—When from the stem it is of an irregular shape, covered with a dense spongy rust or orange-coloured layer. The bark from the branches is curved, has a dark-grey corky layer, from which numerous white warts protrude, and comes in solid pieces not pared towards the edges.

3. *Brazilian Angostura Bark* consists of slightly curved pieces, 20 to 25 c.c. (8 to 10 inches) in length, and 1 to $1\frac{1}{2}$ mm. (about $\frac{1}{16}$ inch) in thickness. It possesses a lasting bitter taste, does not swell in water, is often covered with an ash-grey layer, occasionally with extraordinarily strongly developed warts, and is always marked with longitudinal red or black spots on a yellow ground. The inside of the bark is red, and has paler, distinct, elongated fibres.

4. *Guaiacum Bark*.—Flat or slightly curved, very hard and compact pieces, 4 to 6 mm. (about $\frac{1}{8}$ inch) in thickness, covered with a brown-grey, corky layer, partially peeling off, and having a smooth, whitish-grey bast.

5. *Copalchi Bark*.—Long, cylindrical quills, 2 to 6 mm. ($\frac{1}{8}$ to $\frac{1}{5}$ inch) in thickness, covered with a corky layer, whitish or light yellow, dense, hard, compact; bast reddish brown, fracture coarse and irregular. The odour of the powdered bark is terebinthinous, and its taste strong and bitter.

6. *Cinchona Bicolorata* or *Tecamez*.—Flat, curved or quilled pieces,

7 to 30 c.c. (3 to 12 inches) in length, and 1 to 2 mm. ($\frac{1}{25}$ to $\frac{1}{12}$ inch) in thickness, externally smooth or somewhat wrinkled, variable in colour; the middle layer is cinnamon-brown, the inner surface is longitudinally striate, and the bast layer very thin.

7. *Bark of Samadera Indica*.—Voluminous, slightly curved pieces, having a yellow or brown corky layer and a fibrous bast; the inner layer is darker than the bark parenchyma.

Berberis Aquifolium. (*Druggists' Circular and Chem. Gaz.*, July, 1878.) *Berberis Aquifolium*, Pursh. Leaflets 1-6 pairs, not approximated, coriaceous, ovate-lanceolate, or elliptical oblong, oblique and slightly cordate at the base, margin repand with thorny or spinulose cuspidate teeth; racemes short, nearly erect, clustered; filaments two-toothed; berries dark purple. Leaflets generally 2-3 pairs, very coriaceous, and in this locality more or less evergreen. Flowers yellow. This is an under shrub, eight to eighteen inches, rarely, but sometimes, three feet high, branching, erect, but often procumbent. The leaflets one inch to two-and-a-half inches long, reticulated, often obscurely, on both sides. Common to the middle elevations of the northern portions of the hills, to the Big Horn and Wolf ranges, the middle elevations of Colorado, the head waters of the Arkansas, and in the Ratoon ranges.

The *B. pinnata* and *B. repens* seem to be but varieties of this; the characters are certainly not distinct, as far as the author's observation extends. This plant is generally found abundantly upon exposures to the South and East, in rich vegetable mould which covers these hill-sides. It is also found upon almost barren rocky places, especially the feldspathic granite and porphyritic formations; but, of course, less robust, the leaflets very seldom having more than two pairs, and approaching nearer the form of the *B. repens*; the berries smaller, more acid, and less pleasant in flavour. It flowers in May and ripens its fruit in August and September. The fruit is acidulous, and in flavour reminding one of the lime; dark purple in colour, and covered with a bluish bloom. Root yellow.

This plant is termed "Oregon grape;" but it is difficult to conceive why it was thus named.

The root is the part which is used as a medicine; this is one or two feet or more in length, and about a quarter inch in diameter, more or less woody, and in colour a bright yellow, often orange-yellow; the cortical portion thin, of the same colour, the epidermis thin and papyraceous, dull greenish or brownish yellow; the upper portion of the root is quite woody, and hardly to be distinguished from the stem above ground.

The author's attention was first called to this plant some years ago by the hunters and guides, with whom it was a remedy of great value in the treatment of the low bilious fevers of the mountains, and in all forms of biliousness. The berries are often employed as an antiscorbutic, and are also made into a sauce and used as food.

The plant has, in general, the medical properties common to the *Berberidaceæ*, and unites in a marked degree the properties of the *Hydrastis Canadensis* with those of the *Podophyllum Peltatum*; but it has not the valuable and peculiar local effect upon the mucous membranes found in *Hydrastis*. More recently the author's attention was directed to its value in disorders of the stomach and bowels, arising from improper and insufficient food. But it is in bilious fevers and their allied forms that he has seen its best effects. The root yields its medicinal virtues to water and dilute alcohol, and without any doubt contains an active principle, which, probably, is an alkaloid, similar to, if not identical with, hydrastina in the *Hydrastis Canadensis*, and not a resin as in *Podophyllum*. Its therapeutical effects, however, would seem to indicate that it is combined with "a peculiar resin" which modifies the therapeutic action of hydrastine; but, so far, no attempts have been made to isolate it.

Among the hunters and Indians it is usually given in the form of a decoction—their only mode. The author has also used it in the form of a strong tincture, 4 ounces to the pint of dilute alcohol, administered in accordance with the result desired—from 3 to 5 drops to a teaspoonful. In cases of bilious fever he has found that it has its best effect when given in doses of 20 to 30 drops, no regard being paid to its action on the bowel, unless it should produce catharsis, which is very seldom the case.

Poisonous Properties of the Seeds of *Agrostemma Githago*. E. Reichardt. (*Archiv der Pharm.*, ccxiv., 87.) Experiments on animals have proved that these seeds possess marked toxic properties. In all cases it produced diarrhoea and severe inflammation of the bowels; and where larger doses were given, these symptoms ended in death.

These observations are important, as these seeds are sometimes used in France as an adulterant of flour, for which purpose they are ground along with the grain.

The Bark of *Myroxylon Perniferum*. T. Peckolt. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 145.) The fresh bark was analyzed by the author, and found to have the following composition:—

In 1000 Parts.

Essential Oil	0.900
Myroxylin (crystallized)	4.660
Balsamic Extractive	20.000
Bitter Extractive	10.290
Tasteless and colourless Extractive	1.840
Wax-like Substance	5.530
Albuminoid Substance	12.120
Resin	150.970
Cinnamic Acid	9.770
Benzoic Acid	Traces.
Tannic Acid	5.940
Glucose	16.120
Pectic Substances, Dextrin, Inorganic Salts, etc.	26.040
Fibrous Matter and Moisture	691.300

A False Pareira Brava. C. Morrison. (*Amer. Journ. Pharm.*, Sept., 1878.) The drug examined was of Brazilian origin, and sent to the United States as true "pareira brava, obtained from *Cissampelos Pareira*;" but it corresponded neither to the description of *Cissampelos* nor of *Chondodendron*. It consisted of the woody stems of a menispermaceous plant, was covered with a grey bark, and the bright yellow wood was formed of more or less eccentric layers of fibro-vascular tissue.

The drug was reduced to fine powder; 12.0 grams of it exposed to a temperature of 200° F., lost 1.21 gram, equal to 10.1 per cent. 10 grams, dried as above, moistened with alcohol and packed firmly in a conical percolator, required 15½ ounces of alcohol to exhaust it. On again carefully drying, it was found to weigh 9.025 grams, showing the alcohol had taken up .975 gram. The percolate was evaporated to 2 fluid ounces, and 25 drops of sulphuric acid added; on standing two days it threw down a precipitate of a dark yellow colour, weighing .3665 gram. The balance of the drug was then exhausted with alcohol in the same manner, and the percolate reduced by evaporation to 3 fluid ounces, to which, while hot, 40 drops of sulphuric acid were added. After two days a large quantity of dark coloured crystals, having a smell very similar to honey, was obtained. The mother-liquor was drained off, and the precipitate washed with water acidulated with sulphuric acid, 20 drops to the ounce, until the colouring matter was all removed. The residue was dissolved in hot alcohol, from which it was thrown down, on cooling, in beautiful yellow stellate crystals, which were further purified with the aid of animal charcoal and by crystallization from

alcohol. The crystals resembled those of berberina salt in appearance, and to prove their identity the same tests were applied to both, when it was found that muriate of berberina readily volatilized, while the other product was carbonized and required the addition of nitric acid to make it volatilize readily. The berberina salt does not form a clear solution with ether, but the salt obtained was readily soluble, forming a bright yellow solution. The berberina salt is less soluble in cold water, and almost insoluble in ammonia water; while the other is readily soluble. Treating boiling aqueous solution of each with a solution of bichromate of potassium, the product of the false pareira did not show any signs of precipitation until it had stood ten to fifteen minutes after becoming cool; while berberina formed a precipitate before it had become cool, the precipitate in both cases being fine needle-like crystals. On adding a drop of muriatic acid to each of the above precipitates, diffused in water and heating, the solution remained clear after cooling; while berberina threw down a bulky precipitate.

Treating cold aqueous solutions of each with a solution of nitrate of silver in hyposulphite of sodium, the pareira alkaloid was not precipitated, nor was the clear solution changed by heating; while berberina threw down fine light-coloured, needle-like crystals, the clear solution, also, being unaffected by heat. To a hot alcoholic solution of each a solution of iodine in iodide of potassium was carefully added; berberina threw down a precipitate of beautiful green spangles, while the other deposited a reddish brown crystalline precipitate. The dark-brown substance having a sweet honey-like odour, above referred to, was readily soluble in ether and in hot and cold alcohol; insoluble in petroleum benzine, soluble in caustic potassa, which solution was not precipitated by muriatic or sulphuric acid. The ethereal solution, on evaporation, yielded a powder of a brown colour.

The filtrate from the first precipitate obtained with sulphuric acid gave a precipitate with ammonia water which was not re-dissolved on adding an excess. The sulphuric acid was removed with carbonate of barium; the liquid, acidulated with hydrochloric acid and treated with Mayer's test, gave a heavy precipitate of a light yellow colour. The filtrate was rendered alkaline by ammonia, and agitated with ether, but the ether did not take up anything. On treating the precipitate by Mayer's test with an excess of carbonate of potassa, it was turned of a dark dull red hue, and gave, with a mixture of one part of ether and two of alcohol, a light yellow solution, from which a slight reaction with Mayer's test was obtained;

with solution of iodine in iodide of potassium light yellow crystals were formed.

It appears from the above that this false pareira brava contains two alkaloids, both of a yellow colour, one of which is similar to berberina, but differs from it in several important reactions.

Lotur Bark. Dr. O. Hesse. (*Ber. der deutsch. chem.-Ges.*, xi., 1542.) Lotur bark, the bark of *Symplocos racemosa*, contains three alkaloids, viz.: *loturine*, 0.24 per cent.; *colloturine*, 0.02; and *loturidine*, 0.06 per cent. The alkaloids are extracted from the bark by hot alcohol, and are converted into acetates. Loturine and colloturine are precipitated from the neutral solution by the addition of potassium thiocyanate, leaving the loturidine in solution. The crystalline precipitate is decomposed by soda, and the alkaloids are extracted with ether and recrystallized from alcohol. The efflorescent crystals of loturine are separated mechanically from the non-efflorescent crystals of colloturine.

Loturine is soluble in alcohol, ether, chloroform, and acetone; but is insoluble in water, ammonia, and caustic soda. It gives no coloration with ferric chloride, strong sulphuric or nitric acids, or even on the addition of bleaching powder and ammonia. Loturine melts at 234°, and sublimes, forming colourless prisms. The fluorescence exhibited by a solution of loturine in dilute acids is more intense than that of quinine sulphate. Loturine forms well crystallized salts. The hydrochloride, which crystallizes in white prisms soluble in alcohol and in water, forms double salts with the chlorides of potassium, gold, and mercury. The hydriodide forms a crystalline double salt with mercuric iodide. The nitrate, thiocyanate, acetate, chromate, and picrate are crystalline compounds. The tannate and phosphotungstate are amorphous powders.

Colloturine is deposited from alcohol in prisms terminating in pyramids, which sublime at 234°. This solution of the alkaloid in dilute sulphuric or hydrochloric acid is fluorescent. Gold chloride produces a yellow amorphous precipitate in the solution of the hydrochloride.

Loturidine.—The filtrate from the thiocyanates of loturine and colloturine is rendered alkaline by ammonia, and the loturidine extracted with ether. The latter is a yellowish brown amorphous body, yielding amorphous salts. It dissolves in strong nitric and sulphuric acids, forming yellow solutions. The solution in dilute acids is fluorescent.

Winckler's *californine* was not a simple substance, but a mixture of the acetates of these three alkaloids.

Paeonia Moutan. M. Jagi. (*Archiv der Pharm.*, ccxiii., 335.) The author has chemically examined the root of this plant, which is frequently prescribed by Japanese physicians. An ethereal tincture of the root, allowed to evaporate spontaneously, left a crystalline residue which, after purification, formed white shining needles, fusing at 45° C., and subliming at a higher temperature, giving off an aromatic odour at the same time. The crystals were insoluble in cold water, and fused when treated with hot water. They were readily soluble in alcohol and ether, and separated from the alcoholic solution on the addition of a large proportion of water. The alcoholic solution left on evaporation prismatic crystals measuring 5 to 15 mm. in length. It formed white crystalline precipitates with silver nitrate, mercuric chloride, ammonium oxalate, and alkaline sodium phosphate, and a yellow precipitate with potassium iodo-hydrargyrate. The ultimate analysis of the crystals gave the following numbers:—C = 46.02 per cent., H = 7.74 per cent., O = 28.22 per cent.; and the molecular weight, as calculated from an analysis of the calcium salt, was found to be 169. The author considers this substance as a fatty acid, closely allied to capric acid, from which it differs by its higher melting point.

Therapeutical Properties of Monnina Polystachia. (*The Fractitioner*, August, 1878.) Amongst the medicinal plants recently suggested as possessing important therapeutic value is the *Monnina polystachia*, one of the Polygalaceæ, which has an extensive distribution, growing near the summits of steep mountains in South America, as well as in the woody plains and marshy districts of the same region. It is a pretty plant, to which, however, hitherto but little attention has been paid by chemists. Therapeutic virtues have been attributed to two parts of the plant,—the bark of the root and the recent leaves. The latter are regarded as expectorant, whilst the former is considered to be astringent. The root of the plant is fusiform, sixteen or eighteen inches in length, of yellowish colour, with scattered darker spots, slightly disagreeable odour, and taste at first sweetish, but subsequently becoming acrid and bitter and exciting salivation. Its infusion is turbid, like soapy water. By the Americans it is named, “yallhoy,” and the bark of the root is pounded and made into a paste. No complete chemical analysis has as yet been made of this drug, but it is known that it contains a large proportion of resinous material. This appears to be divisible into three parts: one of which is soluble in ether, a second soluble in alcohol, and a third equally resinous, to which they give the name of monninia. The drug can be administered both as a

powder and in infusion. The dose is from 10 to 12 grams per diem. The following are some of the preparations: *Tincture*.—Bark of the root, 100 grams; alcohol, 300 grams; macerate for four days, frequently agitating, and filter; then add sulphuric ether, 150 grams, macerate for forty-eight hours more, and mix the two liquids *Ointment*.—Extract of monnina, 4 grams; lard, 20 grams; essence of lavender, 4 drops. Ft. ung.

Bateator Root. S. Martin. (*L'Union Pharmaceutique*, 1878, No. 8.) This root is derived from a plant growing in Senegal, and is spoken of as a substitute for ipecacuanha, with which it corresponds in its effects. Seeds have been planted in the gardens of the Natural History Museum, at Paris, and a description of the plant is promised in due course.

Constituents of Liquorice Root. F. Sestini. (*Gaz. Chim. Ital.*, viii., 131.) The author's analysis of the fresh and dried roots, gave the following results, expressed in percentages:—

	Fresh.	Dried at 110° C.
Water	48.700	—
Resin, Fat, and Colouring Matter .	1.650	3.220
Glycyrrhizin	3.271	6.378
Starch	29.620	57.720
Cellulose	10.150	19.790
Albuminoid Substances	3.267	6.373
Ammonia (combined)	0.022	0.043
Asparagine	1.240	2.416
Ash	2.080	4.060

An Adulteration of Senega. E. M. Holmes. (From a paper read before the Pharmaceutical Society, November 6, 1878, and recorded in the *Pharm. Journ.*, 3rd series, ix., 410.) A sample of senega root, forwarded to the author by a friend for examination, was found to contain a considerable quantity of vincetoxicum root (*Asclepias Vincetoxicum*, L.).

The following description will serve to identify the root:—

Asclepias Vincetoxicum, L.—The so-called root is in reality a rhizome, having a well-marked pith, remarkable for its pale colour and smooth, unbranched rootlets. The main portion is smooth, cylindrical, and pale, and from about one-fourth to one-third of an inch in thickness; at intervals of a half or one inch tufts of rootlets arise. The rootlets are smooth, scarcely furrowed, and by their number often nearly conceal the stouter portion of the rhizome. The taste presents nothing remarkable, and the odour is faint and earthy.

When broken across, the rhizome is seen to have a yellow centre and white cortical portion. On examination with a pocket lens, the yellow portion is seen to consist of wood, and to have in its centre a well-defined pith. The rootlets are similar in structure, but have no pith.

From the above description it will be seen that it has no resemblance to senega, except in colour; but senega being sometimes composed largely of small roots, the asclepias might easily be overlooked when mixed with it.

From valerian, which it much more resembles, it may be known by the smoothness of the rootlets (those of valerian being furrowed), and by the more slender cylindrical stem between two tufts of rootlets; the rootstock of valerian being so closely covered with rootlets that its larger size is only visible at the upper end, where it may be seen to be one-half or three-quarters of an inch in thickness, and of a dark colour internally. For convenience of reference these distinctions are tabulated thus:—

Polygala Senega.	Vincetoxicum.	Valerian.
Root one-third inch tapering.	Rhizome one-third inch thick, cylindrical.	Root one-half to one-quarter inch, concealed by rootlets.
In section, centre pale, no pith.	In section, centre yellow, evident pith.	In section, darker; rootlets brown, with darker centre.
Root spirally twisted, sparingly branched below, with keel on concave side.	Rootlets numerous, in tufts an inch apart, pale, smooth.	Rootlets greyish, furrowed, covering the root.
Taste acrid, causing salivation.	Taste and odour slight.	Taste bitterish, odour strong.

If this root has been used in making decoctions, its presence may easily be detected by tincture of iodine; for the cortical portion of vincetoxicum contains an abundance of small starch granules, while senega contains none. This may be easily ascertained by applying a drop of solution of iodine to the rootlets, when the cortical portion of vincetoxicum becomes of a blackish colour, the central portion remaining unaffected, while senega does not darken at all.

A curious property of the decoction of vincetoxicum is mentioned by Feneulle (*Journ. de Pharm.*, 1852, p. 305). He found that the decoction was opalescent when heated, but became transparent on cooling. This might also serve to reveal the presence of this drug.

The author adds the following particulars regarding this adulterant:—

The plant received its name of *dompte-venin* from its supposed properties as an antidote to poisons, a reputation probably founded on its powers as an emetic. It was formerly also used in dropsy, cutaneous diseases, and scrofula; but is now little used, at least by the medical profession, but enters into the composition of the *Vin diurétique amer de la Charité*. According to Wood and Bache's "Medical Dispensatory," it is capable, in large quantity, of produc-



ASCLEPIAS VINCETOXICUM AND POLYGALA SENEGA.*

ing dangerous, if not fatal, inflammation of the stomach. Whether this be the case equally in the dried state is doubtful; but its presence in senega must, to say the least, depreciate the effect of that drug by dilution.

Preparations of Remigia Ferruginea. Dr. H. Hager. (*Pharm. Centralk.*, 1879, 12.) Vieirin or vieiric acid, the bitter principle of the root-bark of this plant, is best prepared by mixing the powdered bark with half its weight of calcium hydrate, exhausting with boiling water, acidifying the filtrate with hydrochloric acid, and decolorizing the precipitate thus obtained with animal charcoal.

* The woodcuts of this and subsequent illustrations were kindly lent by the Editor of the *Pharmaceutical Journal*.

It was first introduced by Dr. Vieiræ, who recommended it for the treatment of scrofula and chachitis. It is insoluble in water, ether, and volatile oils; sparingly soluble in fatty oils; and readily soluble in alcohol and chloroform. Its taste is extremely bitter. It possesses acid properties, and forms soluble salts with the alkalies and alkaline earths.

Tinctura vieirinae is a solution of 1 part of vieirin in 10 parts of rectified spirit.

Syrupus Vieirinae, var. *Calcariae vieirinae*, is made from 3 grams of vieirin, 3 grams of slaked lime, and sufficient water and sugar to make 300 grams of syrup. One teaspoonful contains 0.2 gram of the lime salt.

The Tannin and Bitter Principle of Hops. C. Etti. (*Dingl. polyt. Journ.*, ccxxviii., 354-357. From the *Journ. Chem. Soc.*, October, 1878.) The substance named "lupulo-tannic acid" (*Dingl. polyt. Journ.*, ccxxvii., 491) by the author does *not* precipitate gelatine; if, however, it is dried at 120°-130°, it changes from a yellowish white to red, loses water, and when dissolved in very dilute alcohol, precipitates gelatine completely, just like ordinary tannin.

On heating the yellowish alcoholic solution of the original tannin on the water bath, it becomes red, and on evaporation a dark red residue remains, which also precipitates gelatin when again dissolved in dilute alcohol. The author calls this "phlobaphen."

Analysis gives the same composition for this as for the red compound obtained by heating the lupulo-tannic acid at 120°-130°, each having the formula $C_{50}H_{46}O_{25}$; and they may be supposed to result from the expulsion of a molecule of water from two molecules of tannic acid.

The coarsely powdered hop flowers are placed in an extraction apparatus; and after being freed from resin and bitter principle as much as possible, the mass is extracted with 20 per cent. alcohol. On evaporating to a small bulk and cooling, a red precipitate of phlobaphen is formed; this is dissolved in 90 per cent. alcohol, evaporated to dryness, and heated to 120°-130°. If it tastes bitter, the bitter principle may be removed by ether. Phlobaphen is easily soluble in alkalies, and is precipitated unchanged by dilute mineral acids. On boiling the freshly precipitated and not previously heated phlobaphen with dilute mineral acids, it is decomposed, glucose and one molecule of water being split off.

As the phlobaphen is easily prepared, is constant in composition, and precipitates gelatine solution completely, it may be estimated

quantitatively like tannin, and may be used in standardizing the solution employed.

An ethereal extract of hop flowers contains, besides an essential oil, chlorophyll, a crystallized white and an amorphous brown resin, to which the bitter principle adheres. After driving off the ether, 90 per cent. alcohol dissolves brown resin and the bitter principle, which may be separated from each other by adding water as long as the resin continues to be precipitated. Repeated solution in alcohol and dilution with water frees the resin from the bitter principle. The aqueous solution is evaporated in a vacuum over sulphuric acid, the amorphous residue dissolved in 90 per cent. alcohol, again evaporated; and so on repeatedly, until well-formed, extremely bitter colourless crystals are obtained. The crystals are completely soluble in water. The experiments oppose the idea that the "bitter resin" of hops can be dissolved in water only with the aid of sugar, tannic acid, gum, ethereal oil, etc. The brown amorphous resin and the bitter principle of hops are two fundamentally different substances.

Scopalia Japonica. Dr. G. Martin. (*Archiv der Pharm.*, ccxiii., 336.) This solanaceous plant occupies an intermediate position between *Solenum* and *Atropa*, and is used by Japanese physicians for the same purposes for which *Atropa belladonna* is employed in Europe. It is often called Japanese belladonna. The root possesses narcotic properties, but by no means to the same extent as belladonna. It contains solanine, but no atropine. A peculiar characteristic feature of this plant is its very striking fluorescence.

Chaulmoogra Oil. J. Moss. (*Chem. and Drugg.*, 1878, 529.) *Gynocardia odorata*, the plant yielding this oil, abounds in districts about the Lower Himalayas, approaching Sikkim; and the seeds are collected there in December and sent down to Calcutta. The outer integument is removed, and only the nucleus with the endopleura is treated for oil, during a period which may extend from December to the end of February. The best yield, 10 per cent., is obtained from the fresher seeds in December. Two processes are employed, pressure without heat being considered to yield an oil having the best keeping properties.

At ordinary temperatures the oil is a granular solid, not unlike beef dripping in appearance and colour, but of a firmer consistency. At a slightly elevated but not warm temperature it begins to liquefy; and the pale granular part, of which it chiefly consists, is thrown into relief by the amber-coloured fluid portion of lower melting

point. The oil melts at 42° C., and at that temperature has a specific gravity of .930. It is most capricious in solidifying, sometimes doing so as the temperature falls, and not unfrequently refusing to become solid for hours, or even days, after this has taken place. This character of the oil is very marked if it be melted with ozokerine, and the mixture is stirred until cold; it refuses to solidify, though if the two be mixed in a mortar, or with a knife on a slab, a smooth ointment results of good consistency. The oil has an acid reaction, a slight persistent, acrid taste, and a faint smell recalling virgin scammony.

The oil being given internally, as well as used externally, the mode of administering it is a subject of importance. Being a solid in our latitude, it must be melted before measuring out the 5 to 15 drops forming a dose, which is sometimes taken on sugar. Here are two objections. In the first place, this, like other alterative medicines, has generally to be taken for a considerable period, and to warm the bottle regularly three or four times a day in order to get out the dose, besides being inconvenient in itself, is trying to the patience; in the second place, the unpleasant taste and smell remain without amelioration. To obviate these objections, the author suggests that the chaulmoogra be given in the form of capsules or perles, holding the minimum dose—from 3 to 4 grains. In this form the dose is already divided, and neither taste nor smell can be perceived by those taking it. For external application, the oil is already in a convenient form; and for the ease and smoothness with which it rubs over any surface where this mode of using it is permissible, it has been likened to goose-grease. To parts which are very sore, and hence cannot be rubbed, it should be softened by warmth, and applied lightly with a soft brush. A more economical way of using the chaulmoogra is in the form of ointment, and a satisfactory formula for this is as follows:—

Ol. Gynocardæ	2 parts.
Paraffin Wax (106° F.)	1 ..
Ozokerine	5 ..

The author has submitted the oil to a preliminary chemical examination, dealing principally with the action upon it of water, alcohol, ether, chloroform, carbon-bisulphide, and benzin. The results will be found in the original paper. He has also studied Dymock's reaction (see *Pharm. Journ.*, March, 1876); and this he attributes to a characteristic and peculiar proximate principle,

which is probably also the active principle. Experiments having for their object the isolation of this principle are in progress.

Evodea Glauca. Dr. G. Martin. (*Archiv der Pharm.*, cexiii., 337.) *Evodea glauca*, a plant belonging to the Order Rutaceæ, yields a bark which is extensively used by the Japanese, both medicinally and for dyeing purposes. The bark is pale yellow, with a slight greenish hue, and covered with a corky layer. It is soft, very fragile, readily separable into thin lamellæ, and has a strongly bitter and afterwards mucilaginous taste. The author's examination of this drug shows it to contain a considerable amount of berberine.

Cimicifuga Racemose. F. H. Trimble. (*Amer. Journ. of Pharm.*, October, 1878.) The concentrated tincture of black snake-root was precipitated by water, and the resin collected and put aside. The aqueous filtrate was precipitated by basic acetate of lead, the precipitate suspended in alcohol, decomposed by sulphuretted hydrogen, and the alcoholic filtrate evaporated. The residue was amorphous, could not be obtained in crystals, and gave with ferric chloride a dark green colour, similar to that produced by quercitrin; but appears not to be a glucoside, since after boiling with muriatic acid, Trommer's test failed to indicate the presence of sugar. The aqueous filtrate from the resin yielded with gelatin a white precipitate, which, however, after having been washed with water, was not coloured black or dark green by ferric chloride, proving the absence of tannin.

The resin of *cimicifuga* was freed from fatty matter by petroleum benzene, and afterwards exhausted with chloroform, which dissolved an uncrystallizable resin, soluble in alcohol and ether, but insoluble in oil of turpentine and bisulphide of carbon. Its alcoholic solution, which has an acid reaction, was precipitated by subacetate of lead, the filtrate freed from lead by sulphuretted hydrogen, and evaporated spontaneously. It was expected to yield the crystalline principle described by T. E. Conard (*Amer. Journ. of Pharm.*, 1871, p. 152); but crystals could not be obtained, though the yellow resinous mass had the behaviour described by him.

The lead precipitate with the chloroformic resin was decomposed by sulphuretted hydrogen; the filtrate had a decided acid reaction, was freed from some matter yielding with ammonia a brown precipitate, by precipitating with water and redissolving in alcohol. After concentrating and evaporating spontaneously over sulphuric acid, greenish prisms were obtained, which were deliquescent on exposure, had an acid taste, were soluble in ether, alcohol, and water,

yielded with ferric chloride a white precipitate, and when heated on platinum foil fused, burned, and finally left some red-brown residue.

The fatty matter left on evaporating the benzine solution yielded to alcohol a yellow acid matter, which was partially soluble in water, soluble in ether and chloroform, gave with ferric chloride a yellow solution, had an agreeable odour, resembling that of pineapple, and was completely dissipated by heat. The fat was a soft solid at 60° F., but liquid at 100° F., was entirely free from inorganic matter, and on saponification yielded glycerine.

On treating the resin left by benzine and chloroform with alcohol, subacetate of lead, alumina, etc., as described by Mr. Conard, a little resinous mass was obtained, having a behaviour very similar to that of his crystalline principle.

No indications of a volatile oil or of an alkaloid were obtained. The principle which is coloured green by ferric chloride entered to some extent into the various solutions made with simple solvents, but was wholly precipitated by basic acetate of lead.

Guaycuru Root. E. M. Holmes. (*Pharm. Journ.*, 3rd series, ix., 466.) In a paper read at the meeting of the Pharmaceutical Conference in Dublin, Dr. Symes mentioned that in Mr. Holmes' opinion baycuru root was identical with guaycuru root, and that it was probably derived from *Statice Brasiliensis* (see *Year-Book of Pharmacy*, 1878, p. 530.)

The author now states that at that time his opinion was given without having seen an authentic specimen of the root of *Statice Brasiliensis*. Since then, however, he had received for the museum of the Pharmaceutical Society a specimen of what purported to be a genuine root of that plant from the collection of drugs in the department of the Argentine Republic in the Paris Exhibition. As this root differed in character from that presented to the Society by Dr. Symes, it appeared to him desirable to ascertain by close comparison whether baycuru is a distinct drug, or whether several different roots are sold under the name of guaycuru in one district and of baycuru in another. He gives the following description of the drugs in question:—

Baycuru is a somewhat contorted root, about the size of the finger, with a blackish brown rough bark externally, the roughness being due to a large number of minute fissures in various directions, cutting the bark up into minute granulations. The transverse section shows a blackish bark, less than a line in thickness, and a bright pinkish brown spongy medullium, about half an inch in diameter. Under a lens the bark is seen to be distinctly stratified,

and the medutullium has a ring of radiating fissures midway between its centre and the bark. The taste is astringent.

Guaycuru from the Argentine Republic, which appears to correspond to Senor Parodi's description of the root of *Statice Brasiliensis*, has much general resemblance to the dandelion root, being branched at the top like that root. It is marked with scattered short fissures, and under a lens the whole surface is seen to be finely wrinkled in a longitudinal direction only; so that it is not cut up into rough points as in the baycuru. A transverse section of the root is of a dark reddish brown colour. The cortical portion is not stratified, but is much darker near the medutullium, while the medutullium is paler towards its circumference; so that the appearance of a dark line separating the medutullium and cortical portion is very prominent. Under a lens a circle of fine radiating dark lines is seen proceeding from the medutullium half-way through the bark. Minute crystals, probably of sea salt are scattered throughout the tissue. The taste is astringent, and slightly salt and fishy.

From the above description it is obvious that guaycuru and baycuru are not derived from the same plant, and while it may be accepted that the former is derived from *Statice Brasiliensis*, the source of the latter must be left unsettled until the description of the root here given can be identified with that of some other plant.

Chemical and Microscopical Analysis of the Bark of Rhamnus Purshiana (Cascara Sagrada). A. B. Prescott. (*Amer. Journ. of Pharm.*, April, 1879, 165.) The examination embraced (I.) The structure of the bark; and (II.) The chemical constituents of the bark.

I. *The Structure of the Bark.*

1. *The corky layer.*—This consists of the outer epidermis of dark brown weathered cells, then several rows of cells filled with a dark red colouring matter, and in the more recent bark a row or two of cells containing chlorophyll. The red colour is soluble in ether, alcohol, potassium hydrate solution (with a dark brown colour); insoluble in acetic acid.

2. *The middle bark* is made up of parenchymatous cells, which are filled with small starch grains. There are also visible in the *transverse* section several groups of cubical crystals, and in the *longitudinal* section groups of very thick-walled yellow cells. These cells are noticeably affected by the ordinary reagents.

3. *The inner bark* consists principally of yellow medullary rays, separated by bast parenchyma, through which are scattered numerous yellow bast fibres. As seen in *longitudinal* section, these fibres are

frequently surrounded by small cubical crystals. The crystals appear not to be affected by hydrochloric acid.

Almost the entire inner bark (3), and parts of the middle bark (2), are turned cherry-red colour by contact with potassium hydrate solution.

II. *The Chemical Constituents of the Bark.*

1. *A brown resin*, of strong bitter taste, coloured vivid purple-red by potassium hydrate solution. This resin is contained mostly in the middle and inner layers of the bark. It is sparingly soluble in water, freely soluble in alcohol and dilute alcohol, and scarcely at all soluble in absolute ether; soluble in chloroform, in benzol, and in carbon disulphide; soluble in caustic alkali solution, with the splendid colour above mentioned, and precipitated from this solution by acids. Concentrated sulphuric acid colours it blood-red. It is removed from alcohol solution by animal charcoal.

2. *A red resin*, nearly tasteless, coloured rich brown by potassium hydrate solution. It is insoluble in water, soluble in alcohol and dilute alcohol; not freely soluble in ether or chloroform, or carbon disulphide; soluble in caustic alkali solution, with the brown colour above mentioned, this solution being precipitated by acids. Concentrated sulphuric acid deepens its colour brownish red. It is removed from alcohol solution by animal charcoal. In the bark it resides in the corky layer.

3. *A light yellow resin or neutral body*, tasteless, coloured bright red-brown by sulphuric acid, not coloured by potassium hydrate solution. It is insoluble in water, soluble in hot alcohol, sparingly soluble in cold alcohol of 70 per cent., soluble in chloroform, in carbon disulphide, and to some extent in benzol. In the concentration of its alcoholic solution, it deposits in pale orange-yellow granules. Its alcoholic solution gives negative results with the general tests for alkaloids.

4. *A crystalline body*, obtained from absolute alcohol solution, in white double pyramids and some other forms of the dimetric system. The crystals melt and then sublime, at a temperature a little above the water bath, the sublimate being partly crystalline. This substance is not appreciably soluble in ether, chloroform, or petroleum ether; is slowly soluble in absolute alcohol, slightly soluble in 70 per cent. alcohol, soluble in benzol. It is neutral to test papers, and is dissolved by potassium hydrate solution, by acetic acid, or dilute sulphuric acid. It is not coloured by potassium hydrate solution, concentrated sulphuric acid, nitric acid, Frøehde's reagent, or sulphuric acid followed by dichromate. The

alcohol solution gives negative results with the general tests for alkaloids.

5. *A tannin acid*, giving brownish green colour, with ferric salts.

6. *Oxalic acid*.

7. *Malic acid*.

8. *A fat oil*, of yellow colour.

9. *A volatile oil*, not abundant, bearing the characteristic odour of the bark.

10. *Wax*.

11. *Starch* in abundant quantity.

The proportional quantity of the resins 1, 2, and 3, is indicated pretty nearly by the quantity of resin extract obtained as follows:—An acidulated alcoholic solution of the bark was neutralized (with ammonia), and evaporated; the residue dissolved in dilute potassium hydrate solution, this solution precipitated by dilute hydrochloric acid, and the precipitate drained and dried at a gentle heat. (The filtrate contained some resin (1); and the precipitate retained, of course, the dissolved substances not washed out). This crude resin extract (chiefly bodies 1, 2, and 3) was about 10 per cent. of the weight of the bark.

Arenaria Rubra. E. L. Bertherand. (*Journ. de Pharm. et de Chim.*, 1878, 458.) The author confirms the reputed value of this Algerian plant in the treatment of catarrh of the urinary organs arising from gravel and other causes. After a short treatment, the urine of such patients became clear and entirely lost the putrid odour peculiar to it in these complaints, while the pain and other symptoms were rapidly relieved. A decoction of the dried plant is recommended as the best form of administration.

Myrtus Chekan. E. M. Holmes. (From a paper read before the Pharmaceutical Society, Feb. 5, 1879, and printed in the *Pharm. Journ.*, 3rd series, ix., 653.) A considerable quantity of the leaves of this plant having recently been imported with a view to their trial by the medical profession in this country, the author supplies the following summary of the known facts concerning it.

Myrtus chekan, Spreng., is an evergreen shrub, from four to six feet high, indigenous to the central provinces of Chili, where it grows abundantly, forming a kind of underwood in all the quebradas or ravines which follow the course of the small streams. In general character the plant bears a strong resemblance to the common myrtle (*Myrtus communis*); it is much branched, the leaves are evergreen, opposite, entire and smooth, oval-lanceolate in shape;

from one-half to two-thirds of an inch long, and about half as broad, and tapering towards either end, the largest leaves not being more than one inch long and eight lines broad. The flowers are white, resemble those of the myrtle in appearance, and are solitary in the axils of the upper leaves; when the leaves fall off, as they sometimes do, the flowers have the appearance of being arranged in terminal racemes or cymes, and have thus been described by some authors.

As now offered in commerce, chekan leaves present the following characters. The leaves vary from one-half to one inch long by one-quarter to one-half inch broad; they are oval-lanceolate in outline, are furnished with a very short stalk less than one line long, are of a clear green colour, scarcely paler on the under side, a little depressed above the midrib, and slightly rolled back at the edges by drying; the veins of the leaves are scarcely visible on the upper side and only slightly so on the lower. Both surfaces of the leaves are seen to be dotted all over with minute oil glands. When chewed, the leaves first produce in the mouth a peculiar taste, resembling faintly that of bay leaves, in this case, however, followed by a pungency and slight bitterness due to the setting free of the essential oil; this taste is then succeeded by astringency.

At first sight chekan leaves present somewhat the appearance of the smaller kind of buchu leaves (*B. betulina*). From these, however, the odour and entire margin of the leaves easily distinguish them.

By some authors this plant has been placed in the genus *Eugenia*, which differs from *Myrtus* in little except the character of the seed. It is on this account now referred to the genus *Myrtus*. Under the name of chekan, chequen, or cheken the plant has long been known and used in Chili in cases requiring an aromatic astringent of considerable power.

The leading physician in the German hospital at Valparaiso, Dr. Dessauer, speaks very highly of the value of chekan. His attention, he states, was first drawn to the plant by the successful self-treatment by one of his patients in a case of purulent inflammation of the bronchial tubes. Dr. Dessauer then tried the chekan on members of his own family with equal success. He considers it to possess tonic, expectorant, diuretic, and antiseptic properties, and states that he has used it with great success in bronchitis, catarrh of the bladder, and other affections of the mucous membrane; also that at the same time the digestion is improved.

Dr. Dessauer uses the leaves and shoots in the form of infusion,

fluid extract, syrup, and inhalation. The infusion is made in the proportion of 1 part of the leaves to 10 parts of boiling water. The fluid extract is prepared according to the process given in the United States Pharmacopœia for *extractum cinchonæ fluidum*. The syrup is made in the proportion of 1 part of the leaves to 2 of the syrup. The dose of the fluid extract is two or three drams four or five times a day. Dr. Dessauer recommends the syrup as being more aromatic and more easily given to children than the other preparations. The infusion he uses for injections, and the inhalation for sore throat and bronchitis. The taste of the syrup and fluid extract he describes as being much more palatable than those of the *Eucalyptus globulus*, while equalling them in value. These are, however, not the only uses to which chekan has been put, for an old writer on the "Medicinal Plants of Chili," speaks of the plant being used in his day as a sovereign remedy for inflammation and other eye diseases. The juice of the leaves and young wood was expressed, and diluted with water, and used as an eye lotion. A decoction of the bark is stated by Don to have been used successfully in cases of dysentery.

A preliminary chemical examination made at the author's request by Mr. C. H. Hutchinson showed the presence of tannin, and of an essential oil. The ordinary reagents for alkaloids, with the exception of ammonia and of ammonium phosphomolybdate, failed to give any indication of an alkaloidal principle. The reactions of the tannin agreed with those of gallo-tannic acid. The essential oil was soluble in chloroform, ether, and ethylic and amylic alcohols; insoluble in water, and burned with a brilliant white flame. Its odour somewhat resembles that of oil of bays, a character which is also possessed by rectified oil of the common myrtle, with which oil of chekan also agreed in being lighter than water. Whether the two are identical or only closely allied it was impossible to say without further examination, which the limited amount of material prevented.

In connection with this subject, it is interesting to note in a recent communication to a French journal, *La Ruche Pharmaceutique*, that M. Linarix attributes exactly the same properties to the oil of myrtle which Dr. Dessauer does to chekan leaves. It would therefore appear that an alcoholic solution would be a better preparation than either of those mentioned above, since alcohol dissolves both the essential oil and the tannin.

The Constituents of the Bulbs of *Erythronium Dens Canis*.
Prof. Dragendorff. (*Archiv der Pharm.*, xiii., 7.) The bulbs of

this plant, which are used in Siberia both medicinally and as an article of food, have been analysed by the author, with the following results:—

In 100 Parts.

Moisture	9.405
Ash (very rich in Phosphates)	1.169
Cellulose	2.575
Vasculose, Cuticulose, etc.	0.859
Starch	51.247
Glucose (soluble in Alcohol)	4.801
Glucose (left undissolved by Alcohol, and subsequently found in aqueous solution).	9.516
Carbohydrate (Arabic Acid), soluble in Water and readily convertible into Glucose	9.085
Dextrin-like substance	3.390
Metarabic Acid	0.954
Citric and Tartaric Acids	0.520
Oxalic Acid	traces
Albumen	0.011
Albuminoid matter—insoluble in Water	5.162
Fat	0.135
Resin	1.045

No alkaloids were found. The phosphoric acid in the ash amounted to as much as 24 per cent. (P_2O_5).

The "Gum" of the Quebracho Colorado (*Loxopterigium Lorentii*).
P. N. Arata. (*Anales de la Sociedad Científica Argentina*, July, 1878. From *Journ. Chem. Soc.*) This tree, belonging to the anacardiaceous order, is indigenous in, and peculiar to, the northern part of the Argentine Republic. The so-called gum, or rather thickened juice, collects in the cracks and hollows of the wood, in ruby-red concretions, somewhat resembling colophony, but more brittle; it is easily pulverized, and yields a brick-red powder. It is scentless, but has a slightly astringent taste. Sp. gr. 1.3756 at 15°. It is easily soluble in alcohol, acetone, and acetic ether; dissolves also in amyl alcohol, and acetic acid; but is insoluble in benzine, carbon bisulphide, chloroform, and turpentine oil; nearly insoluble in cold water and in ether; nevertheless an ethereal solution, having an emerald-green colour, may be obtained by agitating the gum with ether and water. Boiling water dissolves it completely, and deposits part of it on cooling. It dissolves also in strong sulphuric acid, and is precipitated therefrom by water. Heated in a platinum capsule, it swells up and burns, leaving a shining porous cinder which burns away slowly on continuing the heat. If the combus-

tion be completed in a stream of oxygen, the unburnt residue is scarcely appreciable.

A 1 per cent. solution of the gum in absolute alcohol, in a layer 7 mm. thick, exhibits an absorption-spectrum having a dark band commencing between the solar lines A and B, and terminating at C; another extending for a short distance on each side of D; and a third beginning half-way between D and E, and extending to all the more refrangible part of the spectrum. The same solution in a layer 25 mm. thick absorbs the whole of the spectrum, excepting a narrow space from C half-way to D. A solution of dragon's blood, which in some respects resembles quebracho gum, exhibits a very different spectrum, containing a dark band extending for a short distance on each side of C, and a second beginning just beyond D and occupying all the rest of the spectrum.

Reactions.—Quebracho gum, subjected to dry distillation, yields between 100° and 120° a distillate which remains liquid on cooling, and between 240° and 245° a distillate which solidifies to colourless prisms of pyrocatechin (m. p. 105° nearly, b. p. 240° – 245°). The gum is strongly attacked by concentrated nitric acid, and when heated with the same acid somewhat diluted with water, it is oxidized to oxalic acid and trinitrophenol or picric acid. Fused with potash it yields protocathechuic acid,—

$C_7H_6O_4$ or $C_6H_3(OH)_2$. $COOH$, and phloroglucin, $C_6H_6O_3$.

The formation of these products renders it probable that quebracho gum contains one of the bodies called catechins; but in consequence of the great tendency of these bodies to alteration, the author has not yet been able to obtain satisfactory evidence of their actual presence in the gum. The existence of a catechin in an anacardiaceous plant would be a novelty, these bodies having hitherto been found only in the leguminous, rubiaceous and cedru-laceous orders.

Medicinal Value of the Droseras. (*New Remedies*, Sept., 1878.) There are something over a hundred varieties of the *Drosera* in existence; Australia, so it is said, having the greatest number. They flourish best in moist, shaded, boggy ground, and blossom in July and August. They are all possessed in greater or lesser degree of the peculiar properties of so-called sensitive plants. They are called by various names, such as sundew, rosala, roselle, herbe aux goutteaux, etc.; their distinguishing feature being the long shining red hairs, which beset the surfaces of the leaves and have on their extremities drops of a glutinous shining fluid secreted by minute

glands, and appearing most abundantly when the sun is brightest. The *Drosera rotundifolia* and one or two other varieties are known to have been employed in medicine as long ago as the sixteenth century, when it was given as a remedy for phthisis. Even then Dodorus, of Belgium, remarked that it was too acrid, drying, and hot in its nature to be serviceable, and it has altogether been but little used.

Among homœopathic practitioners, however, it has been noted that in pathogenetic doses it would cause a spasmodic cough resembling that of pertussis, and it has therefore been resorted to in cases characterized by purely spasmodic cough from any source. Hughes reports numerous cases of whooping-cough rapidly cured by the use of the third, twelfth, and even the thirtieth dilutions. The experience of Dr. Eugene Curie, of Paris, is cited by Hughes, and is also referred to by M. Vigier in the *Bulletin Thérapeutique*.

Through Dr. Curie, M. Vigier obtained in 1863, from a herbalist in the Vosges, a large quantity of the herb, which reached him in a fresh state, twice a week, and cost 10 francs per kilogram. It was immediately bruised and placed in an equal weight of alcohol of 90 per cent. After macerating for a month, the mixture was expressed and filtered. Thus was obtained an alcoholate (weaker in alcoholic strength than a tincture) of *drosera*.

This was capable of indefinite preservation, contained all the medicinal principles of the plant, had a dark-brown colour and a characteristic odour. When this alcoholate was distilled, there remained an extract of slight consistency, easy of administration and therapeutically active. With this extract, M. Vigier prepared pills having the following formula:—

Extract of <i>Drosera</i>	. . . .	5 grams.
Powdered Liquorice Root	. . . .	q. s.
To be made into 100 Pills.		

Several years later, M. Vigier had a quantity of *drosera* collected in the forest of St. Léger, by several inhabitants of the neighbourhood, who gathered only *D. longifolia*. The collection of *drosera* in this region was slow and difficult, and it reached him in agglutinated masses, containing also the damp earth and mosses upon which the *drosera* always rests, giving it the appearance of being a parasite. In this condition it served only to make an extract, which proved, however, to possess the same properties as *D. rotundifolia*. M. Vigier found the remedy too expensive for patients who are obliged

to pay a fair price for it; and succeeded, at length, in reducing the cost of the crude drug to five francs per kilogram at the very lowest, and finds that it requires 7 kilograms of fresh drosera to make 1 kilogram when dried; which brings the cost of the dried product to thirty-five francs per kilogram; forty to fifty francs he considers to be a fair retail price; and this, owing to the rarity of the plant, would be increased by any considerable demand. An attempt by M. Vigier to cultivate droseras had failed.

The dried plant, when treated with alcohol of 60° strength, gives a quarter of its weight of extract. He also gives certain formulæ which he has established:—1 kilogram of fresh drosera and a like weight of 90 per cent. alcohol gives 1500 grams of alcoholate, containing, therefore, the extractive matters of 666 grams of the drosera; 1 kilogram of alcoholate when distilled, gives 25 grams of extract; 1 kilogram of fresh drosera gives 143 grams of dry product; 100 grams of dry drosera gives 25 grams of hydro-alcoholic extract, as 1 kilogram of alcoholate.

He recommends that 100 grams of drosera and 1 kilogram of 60° alcohol be macerated fifteen days, then expressed and filtered.

According to M. Vigier, the trials of the drug by Dr. Curie in phthisis seemed to show very favourable results; but upon further analysis of the cases, he was disposed to think that those presenting symptoms of bronchitis were most favourably influenced.

Aconitum Heterophyllum. Dr. v. Wasowicz. (*Archiv der Pharm.*, xiv., 194.) This plant grows at an elevation of 2,500–4,000 metres, in mild regions of the western Himalaya mountains, chiefly in the neighbourhood of Simla, Kashmir, and Kumoor. The finest and largest specimens are found on the mountains Choor, Shalma, and Kadarkanta. The root, which is used in India as an antiperiodic, is ovoid or spindle-shaped, generally flattened at the base, tapering towards the apex, pale yellowish grey externally, white internally; 1·8–7·5 centimetres long, and 6–22 millimetres in diameter in the thickest part, and from 2·5 to 6 grams in weight. It has a bitter, mealy, somewhat mucilaginous taste. An exact description of its microscopic structure illustrated by woodcuts will be found in the original article. The author's analysis shows the presence of the following constituents:—

A fat of soft consistence, probably a mixture of olein, palmitin, and stearin.

An acid, allied to ordinary tannic acid.

Cane sugar.

Vegetable mucilage.

Pectic compounds.

Atisine, an amorphous, non-poisonous alkaloid previously isolated by Broughton, and probably a second uncrystallizable alkaloid.

Starch, the granules of which resemble those of phaseolus and colchicum.

2.33 per cent. of ash, containing aluminium, magnesium, iron, potassium, and traces of calcium, in combination with hydrochloric, sulphuric, phosphoric, and silicic acids.

The yield of the alkaloid atisine amounted to 3 grams from 5 kilograms of dry root. The author's analyses of this substance appear to confirm Broughton's formula, $C_{46}H_{74}N_2O_4$.

The Amount of Ash and Soluble Matter in the Three Kinds of Buchu. H. W. Jones. (*Pharm. Journ.*, 3rd series, ix., 673.)

The drug was successively treated with dry ether, alcohol, and water, until exhausted. The resulting solutions were evaporated to dryness on the water bath, and the extracts so obtained dried in an air bath at $240^{\circ}F.$, until they ceased to lose weight.

The ether extract when so dried was quite free from the characteristic smell of buchu; and therefore contained no essential oil, and represented the chlorophyll, fixed oily matter, and such other substances soluble in ether.

In the case of the aqueous extract the amount of mineral matter was deducted.

Operating in this manner on three different samples of each species of buchu, the results expressed in percentages were as follows:—

	Ash.	Soluble in Ether.	Soluble in Alcohol.	Soluble in Water.
<i>Borosma betulina</i> . . .	4.69	4.62	12.11	13.91
" " . . .	4.47	4.29	13.96	14.25
" " . . .	4.40	3.85	8.79	17.91
<i>Borosma crenulata</i> . . .	4.32	5.70	11.26	13.99
" " . . .	4.01	5.86	15.73	20.72
" " . . .	5.39	4.01	10.10	17.75
<i>Borosma serratifolia</i> . . .	5.03	4.78	11.57	17.92
" " . . .	5.55	4.31	9.87	17.05
" " . . .	5.22	3.91	7.71	22.38

The ash was remarkable for containing a large amount of manganese, and the aqueous extract for a large quantity of mucilaginous matter. 100 grains of *B. serratifolia*, when powdered and boiled with water, yielded 10 fluid ounces of thick mucilage. To

separate the fragments of exhausted leaves, the thick liquid so obtained was filtered through a plug of cotton wool, by atmospheric pressure, into a flask exhausted of air. A bright liquor was thus obtained, which under the microscope showed no leaf fragments.

Note on the Resin of Podophyllum. F. B. Power. (*Amer. Journ. of Pharm.*, August, 1878, 369.) At the time of the publication of his paper on the resin of podophyllum, the author's attention was called to the possible pre-existence of protocathechuic acid in the rhizome, and he has now had an opportunity of pursuing the investigation in this direction. The material worked upon, prepared in the laboratory of Dr. E. R. Squibb, was sent by him to Prof. Flückiger, who placed it at the author's disposal. It consisted of the washed and dried precipitate produced by lead acetate on the mother-liquors obtained in the preparation of podophyllum resin from 400 pounds of powdered rhizome; and this, as stated by Dr. Squibb, was a portion of a lot of 1,000 pounds of rhizome, all practically the same in quality. For complete precipitation, twelve pounds, avoirdupois, of crystallized lead acetate is employed; the washed and dried precipitate therefrom weighing about ten ounces.

This lead precipitate, consisting of the lead compound of the acid resin associated with a small amount of lead chloride, is finely powdered, suspended in water, and saturated with hydrosulphuric acid; the liquid filtered to separate the lead sulphide, which latter is again suspended in water and treated as before, in order to insure the complete removal of the lead. The lead sulphide is then dried and exhausted with boiling alcohol. The amount of acid resin as obtained by the evaporation of the aqueous liquid upon the water bath, is 60 grams. By the evaporation of the alcoholic solution obtained by the subsequent exhaustion of the lead sulphide, 40 grams of resin is obtained; the resin being so much more sparingly soluble in water than in alcohol, that the extraction of the entire amount produced by the decomposition of the lead compound would require repeated treatment with large amounts of water. The acid resin is then further examined, as detailed in the author's previous paper, by exhaustion with ether, and treating the portion soluble therein (which should contain the protocathechuic acid if present, associated with resin) with boiling water. The final product thus obtained consists chiefly of amorphous resin; and all efforts to isolate a crystalline compound therefrom, which would admit of a more minute examination, have been unsuccessful.

Although the peculiar character of the resin in being soluble in water presents a great barrier for a thorough separation and examination of its constituents, yet from the amount of material operated upon, and without reliance alone upon colour tests, the conclusion must be drawn that protocathechuic acid can as yet only be obtained as a decomposition product, and its pre-existence in any drug must still remain a subject for future observation and discovery.

In the course of this investigation notice has also been again taken of the statement of Prof. Mayer, made some years ago, in regard to the presence of a colourless alkaloid in the rhizome, which may be precipitated by lead or acids. That such an alkaloid exists, which is precipitated by lead salts, seems quite improbable, and the results of the present investigation have failed to indicate its presence; in this respect but more fully confirming the results of the author's previous investigation. That the alkaloid berberina is absent, he believes to have quite conclusively proved, and may be supported by the observation of Dr. E. R. Squibb, who has more recently subjected a litre of the filtered liquid, obtained by the precipitation of the resin, to the action of Mayer's solution of mercurio-potassic iodide, but with *negative* results. It may not be inopportune, in this connection, to call attention to the fact which, if generally known, is not always considered, that Mayer's solution of mercurio-potassic iodide, as well as other commonly employed alkaloidal reagents produce precipitates with many other substances beside alkaloids, which may possibly have led other investigators astray, in assuming the presence of an alkaloid in the rhizome of podophyllum.

Thus far, therefore, there are indications, but not yet any conclusive evidence, of the presence of an alkaloid.

Mexican Sarsaparilla. Prof. Radius. (*Pharmaceut. Zeitung*, 1879, 243.) The author considers the Vera Cruz sarsaparilla as not only equal, but as even superior to Honduras, on account of its larger percentage of saponin and resin, on which the efficacy of the root is generally supposed to depend. Honduras sarza contains more starch than Mexican, but the constituent certainly does not add to its medicinal value.

Carex Arenaria. Prof. Radius. (*Ibid.*) The root of this plant is recommended by the author as a substitute for sarsaparilla, to which he considers it quite equal in therapeutic value. This root, moreover, has the advantage of cheapness, as it occurs plentifully in Germany and other parts of central Europe.

Note on the Herba Santa Maria. H. Rey. (*Pharm. Journ.*, 3rd series, ix., 713.) The plant which goes by this name in Brazil is the *Chenopodium ambrosioides*, L., or *C. suffruticosum*, W. It is a native of Mexico, but is now quite naturalized in Brazil. In the southern provinces of that empire it is known under the name of herba de Santa Maria, and in the northern under the names matruz, mentruz, and mastruco. These three names are used also for *Chenopodium anthelminticum*, and for several plants of the Natural Order Cruciferae, viz., *Lepidium sativum*, L. Bonariense, *L. Senebiera pennatifida*, D.C., and *Senebiera incisa*, Willd. In Lisbon and in the Azores, *Chenopodium ambrosioides* is known under the name of "herva tormiquera."

The plant has an almost woody stem about the size of a goose-quill, and from one to two metres in height. The leaves are alternate, lanceolate, sometimes slightly sinuate, or even strongly dentate; the flowers are very small, and of a greenish colour; the inflorescence consist of simple leafy spikes. The fruit is small and entirely covered by the calyx. The seeds are very small, polished, and of a black colour. The root is yellowish externally and white inside. The whole plant has a powerful aromatic odour. In Europe it has been used by Plenck with good results in nervous affections, chiefly in chorea. He has usually given it in the form of infusion, made in the proportion of eight grams of the herb to 230 grams of boiling water, with some bruised peppermint, a tablespoonful being taken morning and evening. He quotes several cases in which the remedy had given relief after all others had failed.

Mr. Mik, of the Vienna hospital, obtained equally good results from its use in similar complaints. He, however, always used it in conjunction with cinchona. In Brazil the tops of the plant are used as a vermifuge, in doses of 6 to 8 grams, either in infusion or made into an electuary with castor oil, forming a dose which, although very disagreeable to the taste, is remarkably efficacious. In smaller doses it is given in infusion as a carminative, diaphoretic, and emmenagogue in amenorrhœa, and in coughs and congestion of the lungs. *Chenopodium anthelminticum* also enjoys a great reputation as an anthelmintic.

Chenopodium ambrosioides is often confounded with *C. anthelminticum*. It differs from the latter in having a leafy inflorescence, and in its less powerful but more agreeable odour. Another species, *Chenopodium Botrys*, L., which with *C. anthelminticum* shares the name of "Jerusalem oak" in the United States, is said to have been used in France with advantage in catarrh and humoral asthma.

The herba Santa Maria of Piso belongs to an entirely different family of plants. It is the *Dracontium polyphyllum* of Linnæus, a plant possessing powerful stimulant properties.

The Saw Palmetto (*Sabal serrulata*). Dr. J. B. Read. (*Amer. Journ. of Pharm.*, April, 1879, 169.)

Botanical Description.—Stem, creeping; branching leaves, circular in outline, fan-shaped, bright green, shorter than the slender plano-convex, more or less spiney-edged, petiole. The numerous (15 to 30) erect divisions slightly cleft at the apex, and without thread-like filaments in the sinuses; spadix densely tomentose, much shorter than the leaves; petals scarcely united; style slender; drupe ovoid, oblong (*S. minima*; Nuttall, *Chamærops*, Pursh.). Sandy soil in the lower districts of Florida and South Carolina. June. Stem 4° to 8° long; leaves 2° to 4° high; drupe black, 8" to 9" long.—*Chapman*.

History.—This plant grows abundantly in the sandy soils of the sea coast and sea islands of South Carolina, Georgia, and Florida, and may perhaps extend into Alabama, Louisiana, and Texas. The belt of territory inhabited by it stretches inland from the coast eight or ten miles. The nearer the sea the more vigorous the luxuriance of its growth. Like most crops its fruit is more abundant in alternate years. It is the common plant of the section of the country in which it grows, forming palmetto scrubs which extend in unbroken range for hundreds of miles, and are, from their density and the saw-like edges of the leaves, almost impassable to human beings. The beach extending from Mosquito Inlet, in Florida, to Jupiter Inlet, is one vast scrub, over one hundred miles long, and from one to three miles wide, broken only by live oak hammocks along the creeks and inlets. The cutting of roads through these palmetto scrubs is not one of the least of the labours new settlers have to undergo.

In addition to the description of the plant above given, it may be added that it has large fibrous roots extending for several feet from the stem, which being half exposed above the sand, render travelling in spring vehicles almost an impossibility.

The saw palmetto is of great use to the inhabitants. With the leaves they form a substantial thatch for their houses, and hunters can readily make from it convenient huts that last for years. The leaves are also collected, dried, put up in bales, and sold for paper stock. The tough, fibrous roots, resembling in texture the husk of the cocoanut, are easily formed into scrubbing brushes. These roots contain a large amount of potash salts, and may be in time a source of that valuable alkali.

The saw palmetto berries, or more properly drupes, ripen in October and November, and may be found until the middle of December. They are about the size of the olive, dark purple in colour, and contain a large quantity of juice, and a pit, shaped like that of the olive. The berries are at first exceedingly sweet to the taste, but in a few seconds this is followed by an acrid pungent sensation that spreads to the fauces, nasal mucous membrane, and larynx. This is in turn succeeded by a feeling of smoothness in all those parts, as if they had been coated with oil. The general impression is that of a sweet and decidedly strong though not unpleasant butyraceous taste, which increases with the age of the fruit. The seeds are enveloped in a tough fibrous membrane, are very hard, and when cut open present a white, oily, glistening substance, which burns readily with a blue flame, and gives off the odour of roasted coffee.

The oils, viz., a volatile oil, soluble in alcohol, and a fixed oil, are obtained from the expressed juice by allowing it to stand for some time. In a few days the oils rise to the surface, and the liquid is resolved into three layers: first a yellow volatile oil, next a thicker greyish brown fixed oil, and then a yellowish watery fluid containing a large percentage of saccharine matter, richer in fact than cane juice itself. By evaporation this fluid yields a rich golden syrup, which neither ferments nor candies, slightly retaining the peculiar taste of the fruit. When the berries are boiled in water the volatile oil is dissipated, filling the atmosphere for a great distance with its pungent vapour, and producing dizziness and headache in those in the immediate neighbourhood.

The residue of seeds and husks, when ground up, forms an oil cake which is greedily eaten by many animals, and fattens more speedily than that of rape or flax seed.

Medical Uses.—From the above account of some of the properties of this plant, its application as a remedial agent seems warranted. In all cases where a highly nutritive agent is needed, it seems to apply well and to fulfil the indications. By its peculiar soothing power on the mucous membrane, it induces sleep, relieves the most troublesome coughs, promotes expectoration, improves digestion, and increases fat, flesh, and strength. Its sedative and diuretic properties are remarkable. It has been used with benefit in cardiac asthma, phthisis (especially laryngeal phthisis), chronic bronchitis and dilation of the bronchial tubes. Its action in catarrhal affections is rapid and permanent. A cold in the head may be abated by two or three doses. Mixed in boiling water and used by inhalation, it has been found very beneficial in chronic ozena.

Berberis Nervosa. P. F. Neppach. (Abstract from an inaugural essay. *Amer. Journ. of Pharm.*, August, 1878, 373.) This is the *Mabonia glumacea* of De Candolle, known in Oregon as *Oregon grape*, and is indigenous to California, Oregon and Washington territory, principally in the coast range and Cascade Mountains, from Vancouver Island to the Bay of Monterey. The part used in medicine is the rhizome, which is horizontal in the ground, very knotty and crooked, and from the size of a quill to an inch in diameter, and has a very thin bark of a dingy yellowish brown colour externally, somewhat lighter internally, and covering a white tough wood. It is regarded as possessing tonic and febrifuge properties, and has been used in syphilitic complaints with asserted success.

The whole rhizome is crushed to a coarse powder, macerated with alcohol, the tincture concentrated, thrown into water, and filtered from the yellow resinous precipitate; the filtrate is somewhat concentrated and well acidulated with hydrochloric acid, when a bright yellow powder is obtained, the warm alcoholic solution of which, treated with a dilute solution of iodine in iodide of potassium—being careful to avoid excess of iodine—gave a bronze-green precipitate. The yellow powder is compared with hydrochlorate of berberina, prepared from hydrastis, in its behaviour to various reagents; the reactions being identical, proved the identity of the substance with berberina.

On examining the yellow precipitate occasioned in the concentrated tincture by water, it is found to contain more berberina, and possibly another alkaloid, which, however, is not isolated.

The powdered rhizome, previously exhausted with strong alcohol, is treated with water. The infusion, on being tested with the usual reagents for alkaloids, gives no reaction; it contains, however, gum and sugar.

The Active Principle of Dita Bark. E. Harnack. (*Ber. der deutsch. chem.-Ges.*, 1878, 2,004.) Jobst and Hesse, in 1878, investigated the active principle of dita bark, and arrived at the conclusion that it contained two alkaloids, namely, *ditamine* and *echitamine*. The author, however, finds it to contain but one alkaloid, which he names *ditaine*. The *ditaine* differs from the bodies formerly known under this name in this respect, that the latter were impure compounds, while the new alkaloid is, according to the author, a true chemically pure alkaloid. As the alkaloid is with difficulty soluble in ether, and this solvent extracts it but sparingly from an alkaline solution, the author, after several trials,

found that it could best be isolated by precipitating it from a carefully purified tincture of the bark with phosphotungstic acid. The free *ditaine* is easily soluble in water, alcohol, and chloroform, little soluble in ether, benzine, and petroleum ether. The hydro-chlorate is soluble in hot water and in alcohol. This salt has, according to the author, the composition $C_{22}H_{20}N_2O_4 \cdot HCl$. The physiological effects which the crystallized ditaine produces in the organism of certain vertebrate animals agree completely with those obtained from *curare*, as had previously been demonstrated by the author.

The Botanical Source of Sarcocolla. W. Dymock. (*Pharm. Journ.*, 3rd series, ix., 735.) Gum sarcocolla is imported into Bombay from the Persian port of Bushire, in bags which contain about two hundredweights. The total quantity imported must be considerable, as from twelve to twenty bags may be seen in a single warehouse.

The original packages always contain portions of the plant, of which the following is a description:—

Fruit.—Pedicels short, slender; calyx three-quarters of an inch long, tubulo-campanulate, chaffy, mouth narrow, five-dentate; it entirely encloses the remains of a papilionaceous flower, and an ovoid, rostrated pod as large as a grain of rice, the external surface of which is covered with a felting of white, cotton-like down, consisting of long simple hairs matted together. Although the pod is mature, the remains of the flower continue firmly attached, even after maceration in water.

The pod is two-valved; attached to its dorsal suture on one side is a single greyish brown, vetch-like seed, having a diameter of one-eighth of an inch; when soaked in water it swells, bursts, and a mass of sarcocolla protrudes; some of the pods are abortive and contain grains of gum.

Stem, woody, composed of numerous radiating, wedge-shaped bundles, thorny; thorns three-quarters to one inch long, and together with the young branches, more or less covered with cotton-like down, and encrusted with sarcocolla.

Leaves, not found.

A handful or two of the fruit may be easily collected from a bale of gum, but most of it has lost its chaffy calyx from friction. As leaves are never met with, it is probable that the sarcocolla is collected by beating the bushes after the leaves have fallen. The exudation must be so abundant as to flow on the ground, as masses of sand glued together with it, of large size, occur in the packages. The author thinks there can be little doubt that the sarcocolla

plant will prove to be one of the desert Leguminosæ, belonging to, or very near to, the genus *Astragalus*.

Medicinal Plants used by North American Indians. Dr. E. Palmer. (*Amer. Journ. of Pharm.*, Dec., 1878.)

Chlorogalum pomeridianum, common soap root of California, and called by Indian and Mexicans *amole*. It produces a large bulb which yields a great quantity of saponin, very good for washing, for which purpose it is much used by poor people and the Indians of California. The rough covering of the root is formed into bunches, tied up, and used for hair brushes by the Indians.

Datura meteloides (Jamestown weed).—The California Indians make a decoction of this plant, which is given to young females to stimulate them in dancing. After the root is bruised and boiled in water, the liquid, when cold, is taken internally to produce a stupefying effect, and is much used by California Indians.

The Pah-Utes call this plant *main-oph-weep*. They bruise the seeds, soak them in water, and expose the mixture to the sun's rays to cause fermentation. This being effected, the liquor is drunk and has the same narcotic effect as the preparation made from the plant or root, with the alcoholic effect added.

Nicotiana trigonophylla, *N. Bigelovii*, *N. attenuata*.—The leaves of all these species of *Nicotiana* are used as tobacco by the Indians of Arizona, Utah, New Mexico, and Southern California. The strength is said to be greater than that of the cultivated variety, though the leaves are smaller.

Ligusticum apifolium, Angelica of the settlers of Utah, *Palmetsnip* of the Pah-Utes.—It is a favourite medicine with these Indians. The root is bruised and used as a poultice for sprains and bruises. A tea is made from the roots, and is taken internally for pain in the stomach. The Indians, if afraid of catching contagious diseases, fill their nostrils with pieces of the root. The strong, aromatic, carrot-y smell may have induced them to believe in the efficacy of this plant as a prophylactic.

Berberis aquifolium, or *Oregon Grape*.—From the roots of this plant a decoction is made in water, or they are steeped in liquor, and taken internally. It is a good remedy for general debility, or to create an appetite, and is considered equal to sarsaparilla in its medicinal virtues. It is a favourite medicine with the California Indians.

Anemopsis Californica, *Yerba Mansa* of the Mexicans.—The root of this plant is a great remedy among the Indians of Arizona, and Sonora in Mexico, and Southern California. It has a strong

peppery taste and odour. A tea made from the roots and a powder prepared from the same and applied to venereal sores are a great remedy. The powder is advantageously used on cuts and sores, as it is very astringent. The leaves, after being heated, are applied to swellings.

Achillea millefolium, Yarrow of the settlers of Utah.—The Pah-Utes make a tea from this plant, and take it internally for weak and disordered stomachs. It is much used by whites in the form of bitters.

Curcubita perennis, called Chili Cojote by Mexicans.—The pulp of the green fruit is used, with a little soap, to remove stains from clothing. The roots of this plant are large and long, and, when macerated in water, are applied to piles, generally with good effect. The seeds are ground fine and made into mush, and eaten as food by many Indians of Arizona and Southern California.

Euphorbia polycarpa, called by Mexicans Golendrina.—A strong decoction made from this plant and applied to snake bites soon produces reaction. Many cures effected in this way are reported. In fact, the Indians of Arizona and Southern California rely entirely upon it in such cases.

Eriodictyon glutinosum, *Yerba Santa* of the Mexicans, and a great medicine among the Indians of Southern Utah, Arizona, and California. A decoction made from this plant, and taken internally for rheumatism and partial paralysis, or applied externally, is an excellent remedy. For affections of the lungs, the leaves are used by smoking or chewing dry, or a tea is made from them and drunk.

Micromeria Douglassii, *Yerba Buena* of the Mexicans.—This is an interesting plant, growing near the sea-coast of California, having a strong minty smell. It is a favourite medicine with the Mexican population of California. The Indians of the same section prepare a tea from it, which is used for fevers and colds. In cases of headache, a quantity of the plant is bound round the head.

Artemisia tridentata, commonly called Sage Brush.—The Pah-Utes make a strong tea from this plant and take it internally for headache, colds, and for worms. It is also a good stimulant, prepared either with water or liquor. It yields a pungent oil, which would be a profitable article of commerce.

A. jilifolia, *Southern Wood*.—This plant on distillation yields a very penetrating oil, which is good for liniments, and the Pah-Utes make a decoction from it excellent for swellings and bruises.

A. ludoviciana, *A. dracunculoides*.—The seeds of these two species are gathered by the Pah-Utes, ground fine, made into mush and

eaten. It is anything but a tempting dish, having a dirty look and strong taste.

A. ludoviciana.—This plant possesses medicinal virtues. The Pah-Utes make a strong tea of it, and use it internally to assist childbirth, whenever assistance is required, which is seldom. In case of hæmorrhage from the nose, they stuff wads of the fresh plant into the nostrils.

Oreodaphne Californica.—This fine evergreen tree of California has a very strong spicy odour. By rubbing the hands and face a short time with the leaves a very distressing headache will be produced. Hahnemann is not the only discoverer of the fact that like cures like; for long before he was born the Indians of California were aware of the power which this plant had to produce a headache in those that were well, and to cure those who are afflicted with it.

Erythraea venusta, a common remedy for ague by Indians and Mexicans of Arizona and Southern California. A tea is made of the plant and drunk, and is certainly a very good substitute for quinia.

Paeonia Brownii, by Mexicans called *Pea-neo*.—The root of this plant is used by the Indians of Southern California for colds, sore throats, and for pains in the chest. It is mealy, and tastes somewhat like liquorice. After being reduced to powder, it is either taken in that form internally or made into a decoction.

Grindelia squarrosa.—A decoction made from this plant is used by Mexicans and Indians of Southern California to cure colds. It is taken internally.

Lycopodium spinosa.—This plant produces a short, fine, silky substance just at the juncture of the roots with the branches, which is used by the Digger Indians to stop the bleeding in gun-shot wounds.

Perezia Arizona.—At the junction of the branches with the roots, and covering the greater part of the former, is a soft silky substance which is used by the Apache Indians in gun-shot and other wounds, to stop hæmorrhages, for which it is well adapted.

Glycyrrhiza lepidota, called by settlers of Utah, Desert Root.—Pah-Utes eat it for its tonic effects. In taste it is much like liquorice. Whites sometimes chew this root in place of tobacco.

Ephedra antisiphilitica, called *Teamster's Tea*, since men travelling with teams in New Mexico, Arizona, and Southern California, camping among Indians, contract venereal diseases, and use this plant abundantly as a remedy, taken internally in the form of tea.

A quantity of the plant is often taken along in case of need. This is a well-known remedy for gonorrhœa among many Indians and Mexicans. It is a strong astringent, and may prove valuable for its tonic properties.

Aspidosperma Quebracho. (*Ber. der deutsch. chem.-Ges.*, 1878, 2189.) The white quebracho tree, *Aspidosperma Quebracho*, belongs to the Order *Bignoniaceæ*, and grows abundantly in the province of Santiago and the vicinity of Catamarca. The name *quebracho* is also used for *Loropterigium Lorentii*, an anacardiaceous plant, which is distinguished from it as *Quebracho colorado*, or red quebracho. The bark of the white quebracho has been used in South America for many years as a febrifuge in the same manner as cinchona, which it is said to rival in its effects. According to Dingler, the bark is covered with a corky layer of a brownish yellow colour. A fresh transverse section is more or less red, has dark yellowish brown, irregular concentric, and somewhat confluent lines (*suberous lamellæ*), and whitish spots (*sclerenchyma cells*). The inner bark is pale yellow and coarsely fibrous, the bast bundles being oblique and irregular, running in different directions. Aspidospermine, the alkaloid, was obtained by Fraude by extracting 1.5 kg. of finely-contused bark in a percolator with a mixture of 5 litres of water and 100 grams concentrated sulphuric acid, precipitating the dark brown percolate with concentrated solution of lead acetate in slight excess, in order to remove tannic acid and most of the colouring matter, filtering, and, after removing lead by sulphuretted hydrogen, treating with sodium carbonate until alkaline. The precipitate was collected, dried, extracted with strong alcohol, boiled with animal charcoal, again filtered, the greater portion of the alcohol removed by distillation, and an equal bulk of water added to the remainder, when, on slow evaporation, the alkaloid separated in brown crystals, which were purified by treatment with animal charcoal and recrystallization. The alkaloid crystallizes in small white glossy prisms, is readily soluble in alcohol and ether, scarcely in water, and melts at 205° to 206° C. Its composition is either $C_{22}H_{30}N_2O_2$ or $C_{22}H_{28}N_2O_2$.

Notes on Liberian Plants. E. M. Holmes. (*Pharm. Journ.*, 3rd series, ix, 853.)

Erysipelas Plant.—This plant is evidently *Tiaridium indicum*, Lehm. (*Heliotropium indicum*, L.), a native also of tropical Asia and America, and is one of the plants whose medicinal use seems common wherever it grows.

According to Dr. Roberts the plant is used in Liberia in the

following manner :—The inflamed part is fomented with an infusion of the leaves, and some of the fresh leaves are steamed or bruised into a pulp, and are applied to the part or bound round it. This is repeated twice a day, and is said soon to reduce the inflammation and heat.

In the Mauritius the leaves, bruised and mixed with common salt, and applied in the form of a poultice, are said to have a diuretic effect.

Ainslie, in his “Materia Medica,” speaks of the plant being used by the native practitioners of India as an application to gum-boils, and to repel pimples on the face, also in certain forms of ophthalmia. In Cochin China it is used for similar purposes; and in Jamaica, where it is called clary, it is used for cleansing and healing wounds and ulcers. Martius also speaks highly of its medicinal properties.

Dysentery Plant.—This plant is also called “Kackeis.” It is a rubiaceous plant, *Oldenlandia globosa*, Hiern., apparently somewhat similar in properties to ipecacuanha. By some the heads of the small pale lilac flowers are chewed, or the leaves eaten like a potherb; others, however, make a strong decoction of the plant, of which two tablespoonfuls are given three times a day.

The use of other plants of this genus is somewhat similar in other countries. Thus in Brazil one species is used for colic; in the East Indies the fresh juice of another is used in diarrhœa.

Abortive Plant.—This is the *Stachytarpheta Jamaicensis*, Vahl. (*Verbena Jamaicensis*, L.), a native of Jamaica. This plant is said by Dr. Roberts to be used by the natives in the form of tea for procuring abortion, but he does not corroborate this statement from personal knowledge.

Barham reports that this plant, under the name of vervain, is used as an emmenagogue, the decoction of the root being employed for this purpose, while the expressed juice is administered for worms in children, and as a purgative. In Brazil, according to Martius, it is used for healing ulcers, and internally for rheumatic affections. In that country it is known as jarbão, urgevão, or orgibão. According to St. Hilaire it is taken by some people as tea, and was at one time sent to Europe under the name of Brazilian tea. He expresses the opinion that it probably is about equal in medicinal value to the common vervain, *Verbena officinalis*; it is nevertheless largely used as a household medicine in Brazil.

Polypodium phymatodes.—Under the name of “male fern” for the fronds bearing fructification, and “female fern” for those without sori, this plant is used in Liberia for nephritis, dysuria,

and other kidney complaints. It is used either in decoction or tincture, the dose of the decoction being two tablespoonfuls three times a-day, and of the tincture a tablespoonful every three hours. The female fern is used for leucorrhœa and prolapsus uteri by the native women.

Cream of Tartar Plant.—This is *Osbeckia rotundifolia*, Sm. (*Dissotis plumosa*, Benth.), a plant belonging to the Melastomaceæ. It is used by the natives as a diuretic and alterative in the same way that cream of tartar is used in this country.

Curcas purgans.—The seeds of this well-known plant are used as a purgative and emetic, under the name of physic nut.

Anacardium occidentale.—This is called by the natives the caustic plant, the oily secretion in the pericarp being used for destroying warts, etc.

Erica Species.—This resin was received from Liberia under the name of copal; but it is evidently a kind of elemi, possibly identical with the African elemi presented to the Museum by the late Dr. Ure.

Externally, the Liberian elemi seems of very inferior quality, presenting a dirty, blackish appearance, the white opaque porous resin only showing here and there. The odour closely resembles that of elemi; it is, however, very much drier and more friable than ordinary specimens of that substance. At the author's request, Mr. E. Fielding kindly examined it, and reports that its appearance belies its quality. The following results obtained by him show that it is a comparatively pure drug :—

Resin soluble in cold Alcohol	.	.	.	0·845.
Resin soluble in Ether	.	.	.	6·120.
Black insoluble Residue	.	.	.	0·035.

The alcoholic solution is surprisingly pale in colour, no darker, in fact, than a solution of sandarach of equal strength, which is the more remarkable when the aspect of the crude material is considered. The black insoluble residue which, as may be seen above, forms only 3 or 4 per cent. of the elemi, on incineration and subsequent heating in the blowpipe flame, gives to the blowpipe flame the strong purplish white tint indicative of potassium, and showing almost entire freedom from sodium. When separated by filtration from the alcoholic solution, and examined under the microscope, the black substance is seen to be of vegetable origin, and to consist almost entirely of fungoid or algal filaments.

Sarracenia Purpurea. F. Hétet. (*Comptes Rendus*, 1879, 185, and *Répert. de Pharm.*, 1879, 109.) *Sarracenia purpurea*, the

American pitcher-plant, is used in rheumatic and goutic affections. The author has found in it several proximate principles, the most important of which is an alkaloid identical in its physical properties and chemical reactions with veratrine.

Wahoo Bark and Euonymin. A. B. Prescott. (*Amer. Journ. of Pharm.*, Dec., 1878, 563.) In 1862 Mr. Wm. E. Wenzell reported that the root bark of *Euonymus atropurpureus* contains a glucoside (which he named euonymin), asparagin, several resins, and a fixed oil, besides well-known non-medicinal substances. The so-called euonymin of commerce is said to be made by precipitating a strong tincture of the drug with water, and contains all constituents of the bark which are soluble in alcohol and insoluble in water.

At the author's suggestion, Mr. J. J. Miller undertook a proximate analysis of wahoo root bark, and readily obtained *euonymin* by Wenzell's process (*Amer. Journ. of Pharm.*, 1862, 387.) It was found to be a white, intensely bitter, odourless, uncrystallizable solid, slightly soluble in water (Wenzell says it is insoluble), soluble in alcohol, in petroleum, slightly soluble in ether (hence wasted by the ether washing of Wenzell's process), insoluble in benzol, and in carbon disulphide. In dilute sulphuric acid it dissolves colourless, in the concentrated acid it turns first yellow, then red-brown; these colours being intensified by adding a fragment of potassium dichromate. Both nitric and hydrochloric acids dissolve it with yellow colour. From its alcoholic solution, iodine solution with potassium iodide gives a brownish red precipitate; potassium mercuric iodide, a white precipitate; sodium phosphomolybdate, a green-yellow precipitate; tannic acid, a slight white precipitate; picric acid, a precipitate only on long standing. The solution of euonymin in dilute sulphuric acid was precipitated green-yellow by sodium phosphomolybdate, the addition of ammonia changing the precipitate to a blue solution which faded on boiling.

The bark of the root was also subjected to a full proximate analysis, following Rochleder's plan in the main. By redistilling several times from sodium chloride solution, then extracting the distillate with benzol, and evaporating this solution carefully, a small quantity of a *volatile oil*, having the odour of the drug, was obtained. This volatile oil was clear, brownish in colour, of balsamic taste, neutral in reaction, and evaporated very slowly on simple exposure to the air. Mr. Clothier, in 1862, found no volatile oil, which may have been due to the solubility of the oil in water not saturated with sodium chloride. In further operations, albumen, starch, gum, wax, resins, fixed oil, and glucose were found.

Note on Curare. Dr. A. N. Blodgett. (*New Remedies*, Nov., 1878, 323. From *Boston Med. and Surg. Journ.*) The author states that the quality of this drug is subject to variations, some specimens being nearly worthless. He has obtained most satisfactory results from solutions of that solid extract which presented a brittle fracture and was of a glistening dark-brown colour. The most useful form for subcutaneous use seems to be a solution of all portions of the drug in distilled water. A sediment is deposited which does not need to be disturbed in using the solution. A dose of such a solution, containing from 0.0075 to 0.01 gram of curare, will usually prove sufficient for an ordinary speckled frog, and is about one-sixth the maximum dose recommended to be used in the treatment of tetanus. Considering the rapidity with which curare is eliminated, the author thinks a larger dose might well be used, and that it should be frequently repeated.

Constituents of the Bark of the Indian Pear-Tree. M. Fleury. (*Pharmaceut. Zeitschr. für Russland*, 1878, 483.) The dry bark, according to the author's analysis, contains in 100 parts:—

Water	5.9
Tannin	12.1
Resin and Chlorophyll	1.8
Soluble in Water (Sugar, etc.)	13.8
Cellulose	34.0
Calcium Oxalate	30.8
Other Salts	1.6

The very large percentage of calcium oxalate is an interesting feature.

The Botanical Source of Myrrh. H. Trimen. (*Pharm. Journ.* 3rd series, ix., 893.) Additional light has lately been thrown on the source of myrrh by a specimen brought back from eastern tropical Africa by the successful German traveller, Hildebrandt. The specimen, a unique one, is preserved in the Royal Berlin Herbarium, and has been the subject of a short note by Hildebrandt (*Sitzungsber. Gesellsch. Naturforsch. Freunde*, Berlin, Nov., 1878, 196), who refers it without doubt to *Balsamodendrum Myrrha*, Nees.

The doubt and confusion prevailing in the whole *Balsamodendrum* genus are especially the attributes of this species, which in this country, at all events, is known merely by the insufficient figure and description of Nees (*Plant. Med.*, tab. 357.) These, published in 1828, were based upon specimens collected at Gison, or Gizau, on the Arabian coast of the Red Sea, by Ehrenberg, in Hemprich's voyage made in the years 1820–25; and they have been repeatedly copied

and reproduced in treatises on *Materia Medica*. (See Hanbury's paper in *Pharm. Journ.*, April 19, 1873, 821.) No additional information or further specimens have, however, since been obtained, and the source of this common drug has remained still practically unknown.

Hildebrandt's specimen was collected in March, 1873, in the Ahl Mountains, which run parallel with the north Somali coast, a short distance inland. The plant was pointed out to him by the natives, who call it "didiro." It forms irregular stunted bushes, reaching at the most nine feet in height, and grows on hot sunny declivities at an elevation of 1500 to 3000 feet. The traveller himself found myrrh on the stem of the tree of which the specimen gathered was a branch; it exudes spontaneously, without any external injury, and is called "moolmol" by the Somali, but "mur" by the Arabs; the former collect it in great quantity, and it is brought to Aden and other Arabian ports, whence it is carried to India and Europe.

The specimen is small and imperfect, consisting only of a small branch with numerous short, horizontally spreading, spinous branchlets, and a few tufts of leaves. These are small and trifoliate, but the two lateral leaflets are so minute as to readily escape attention; the main leaflet is slightly toothed. These characters agree with those of *B. Myrrha*, as seen in Ehrenberg's type specimens, and, so far as they go, show that Hildebrandt has correctly referred his plant to that species.

A large branch sent over in a living state to Kew by Mr. Wykeham Perry, appears to be identical with Hildebrandt's, though, as it possesses no leaves, one has merely the bark, the mode of branching, and the spines as guides. It was obtained in Somali-land, near the parallel of 47° E. long. Mr. Perry gives the Somali names as "dedthin" for the plant, and "mulmul" for the product—evidently the same words as those somewhat differently spelt by Hildebrandt.

From the above the author concludes that myrrh is obtained from *Balsamodendrum Myrrha*, and that that plant grows in Somali-land and on the Red Sea coast of tropical Arabia. Whether it also occurs in Southern Arabia is less certain. The myrrh which is there collected is called by Hanbury Arabian myrrh (*Pharmacographia*, 127-129), and thought by him to be the produce of probably another species. Another fine specimen at Kew from Mr. Wykeham Perry (of which there is a small portion in the museum of the Pharmaceutical Society) scarcely bears out this conjecture, though it is rather less spinous than the Somali ones. There are no leaves upon

it, but some small twigs previously sent by Mr. Perry, and now in the Kew Herbarium, bear a few flowers.

As to the distinctness of *B. Myrrha*, Nees, as a species there is no possibility of deciding until more complete specimens are forthcoming; meanwhile it will be well to maintain it. Though it is certainly very difficult to distinguish the leafless fragments of the different species of *Balsamodendrum*, which are often all that we have in the herbarium, travellers seem to have much less difficulty who see them growing, and the natives recognise and give them names. If kept up as a species, *B. Myrrha* will probably be found to stand intermediate between *B. opobalsum* and the Indian species *B. Mukul*, Hook., and *B. Berryi*, H. and A., with the latter of which it is even perhaps identical.

Sanguinaria Canadensis as an Antidote to Rhus Toxicodendron. Dr. D. J. Parsons. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 198.) The author considers a tincture of this plant as a specific in rhus poisoning. It is well-known that the mere contact of the hands, feet, etc., with the fresh leaves of *Rhus toxicodendron* is sufficient to produce painful inflammation, eruptions, swellings, etc., and these the author finds to yield readily to the local treatment with the tincture. The latter should be applied to the affected parts at short intervals, so as to keep them continually moist with it.

False Calabar Beans. (*Pharm. Zeit.*, 1879, No. 12.) During October last, two different kinds of beans were offered in the London market as calabar beans; one of them was the seed of *Entada scandens*, which are circular, one to two inches in diameter, about one-third of an inch thick, and have a very small hilum; the other was the seed of a species of *Mucuna cylindrosperma*, Welw., about three-quarters of an inch broad, quarter of an inch thick, and provided with an extremely large hilum, passing nearly all round the seed. Genuine calabar beans were scarce.

False Calabar Beans. E. M. Holmes. (*Pharm. Journ.*, 3rd series, ix., 913.) Referring to the adulteration of calabar beans with the seeds of *Mucuna cylindrosperma*, Welw., the author quotes Welwitsch's description of this plant, together with the results of his own observations of its botanical characters as compared with those of *Physostigma venenosum*. The description of the two tallies so closely, that were it not for the difference in the stipules—which in the *Mucuna cylindrosperma* are said to be reflexed and persistent, while in *Physostigma venenosum* they are stated to be deciduous—the author thinks it would be impossible to distinguish between them. Until flowers and further specimens

of the two plants are procurable, he considers it doubtful whether the *Mucuna cylindrosperma*, Welw., is more than a variety of *Physostigma venenosum*, Balf. Until then it should be placed in the genus *Physostigma*, under the name of *P. cylindrospermum*. The author points out that this question of identity is also one of Pharmaceutical interest, as the inquiry naturally arises, whether the beans differ in medicinal power.

Mr. Holmes gives the following characters for distinguishing the seeds of *P. cylindrospermum* from those of the true calabar bean. They are longer than the latter, nearly cylindrical, of a reddish brown colour, with few exceptions of a darker hue, and the hilum

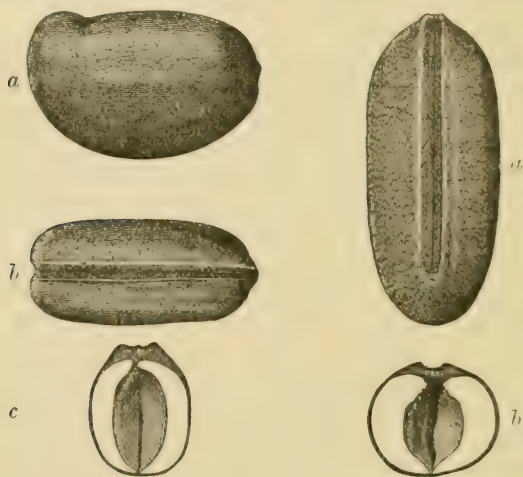


Fig. 1.

Fig. 2.

Fig. 1. *Physostigma venenosum*: a, showing shape of the seed; b, showing the length of the hilum; c, transverse section showing cavity between the cotyledons.

Fig. 2. *Physostigma cylindrospermum*: a, showing relative length of hilum; b, transverse section, showing different shape of bean.

does not extend quite to the extremity of the bean at the end where the mycophyle is visible, but forms there a slight projection, or when the projection is not marked, a portion of the bean about a quarter of an inch in length may be distinctly seen beyond it at the end.

In the calabar bean the colour is mostly very dark purplish brown or nearly black. The hilum extends the whole length of

the bean, so that neither end of it is visible when the hilum faces the eye, and fragments of the funiculus often remain attached as a whitish line to the edges of the hilum. The seed is also broadest in the middle and tapering towards the ends, and is somewhat flattened at the sides.

The author's description is illustrated by the foregoing woodcuts, for which we are indebted to the editor of the *Pharmaceutical Journal*.

Constituents of Ligustrum Ibotu. G. Martin. (*Archiv der Pharm.* [3], xiii., 338.) The seeds of this plant resemble coffee in appearance, and contain a bitter, syrupy substance, which, when treated with sulphuric acid, reduces copper solution. The aqueous extract of the seeds gives a precipitate with lead acetate; and this, when decomposed with hydrogen sulphide and exhausted with alcohol, yields a solution which, when evaporated, leaves a yellowish white powder, apparently a glucoside; sulphuric acid causes it to assume a red colour, which disappears on the addition of water. As this substance cannot be identified with syringin, it has received the name of *ibotin*. The seeds contain 20 per cent. of an oil resembling olive oil, the ash amounts to 3.422 per cent.

Some Constituents of the Rhizome of Sanguinarina. F. W. Carpenter. (*Amer. Journ. of Pharm.*, April, 1879.) The rhizome, in moderately fine powder, was exhausted in a percolator with water acidulated with acetic acid. The percolate was evaporated to a convenient bulk, and ammonia added until a precipitate ceased to form. This precipitate, of a purple colour, was separated from the mother-liquor by a filter, and thoroughly washed with water. The filtrate was of a dark brown colour, having lost the deep red colour of the infusion. The precipitate was then dried, and macerated with successive portions of ether, until no residue was left on evaporation of a small quantity of the solution. The solution thus obtained was a light yellowish red colour, exhibiting a very handsome fluorescence. Concentrated muriatic acid was then heated, and the gas thus given off was passed into the ethereal solution by means of a glass tube, until it was saturated, when a voluminous scarlet precipitate of muriate of sanguinarina was formed. By this means all the alkaloid was precipitated; its salts being wholly insoluble in ether, leaving the ether almost colourless, the slight colour present being due to a small quantity of resin held in solution. The muriate of sanguinarina was purified by dissolving in hot water, filtering, precipitating by ammonia, drying the precipitate, and dissolving in ether. This solution,

treated with animal charcoal, and then with hydrochloric acid gas, as before, gave the muriate pure. The precipitate (*b*) after having been exhausted with ether, was dried and treated with the alcohol; a deep red tincture was obtained. This being diluted with water, a resinous matter was thrown down; the mother-liquor, containing a small quantity of sanguinarina not removed by the ether of first treatment, was precipitated by Mayer's test. The filtrate (*a*) was then neutralized by acetic acid, and a strong solution of tannic acid added as long as any precipitate was formed; this was separated by a filter, and washed until the washings were tasteless, then thoroughly dried, and digested with an alcoholic solution of hydrate of potassium as long as anything was dissolved. The tannate of potash thus formed separated as a dark brown mass, it being insoluble in alcohol, which held the alkaloid in solution, together with an excess of hydrate of potash. This excess was removed by passing carbon dioxide into the solution, forming carbonate of potash insoluble in alcohol. The solution was then decanted from any insoluble matter, and the spirit removed by distillation. The residue was then dissolved in ether, from which the so-called "porphyroxin" separated, on evaporation, as a dirty white crystalline mass. By solution in alcohol, and treatment with animal charcoal, it was obtained, on concentrating the solution, in minute nearly colourless, tabular crystals, of a bitter taste, and very sparingly soluble in water, more readily so in alcohol. It is wholly dissipated by heat, giving off a peculiar odour when burning, and possessing an alkaline reaction. It neutralizes acids, forming with them salts; the hydrochlorate being in the form of cauliflower-like masses, owing to the arrangement of the crystals. But a few grains of this alkaloid were obtained from a pound of root. It seems to differ decidedly from the porphyroxin of Merck, from opium, and is not coloured by nitric acid; is dissolved by dilute acids, but does not become red on boiling. Both the supposed alkaloid and its salts give a deep blue or purple colour with concentrated sulphuric acid, very much intensified by the addition of a small piece of bichromate of potassium.

In a second experiment the root was percolated and the sanguinarina precipitated as before; the alkaloid separated and the filtrate neutralized by hydrochloric acid until a slight acid reaction was obtained. A solution of iodohydrargyrate of potassium was added as long as a precipitate was formed; this was separated from the dark brown filtrate (*c*), washed, and dried. It was then digested in a strong solution of carbonate of sodium, to decompose,

and evaporated to dryness. The residue was treated with hot stronger alcohol, as long as it removed anything. This gave a deep red tincture, which was acidulated with hydrochloric acid, and an equal bulk of water added; this threw down a yellow precipitate, which was separated from the liquid (*a*). The precipitate was insoluble in water and petroleum benzine; partly soluble in ether, chloroform, and the caustic alkalies. It fused at a gentle heat; at a higher temperature it burned, leaving no residue, and giving off the peculiar odour noticed in burning the so-called porphyroxin. It was wholly uncrystallizable, decomposed by concentrated nitric, and not changed by muriatic acid. With sulphuric acid concentrated, it gave the same beautiful deep purple colour noticed above; and like it, deepened by chromic acid, gradually fading, and finally disappearing. It was separated into two portions by ether, the insoluble portion of a grey-brown colour, the ethereal solution of a light yellow colour in transmitted light and red in reflected light. This solution evaporated left a yellow-coloured residue, of a resinous nature, which gave the purple colour reaction, as did also the insoluble portion, the two differing slightly in the shades of colour produced. On treating the original resin with chloroform, the results were almost identical with those obtained by ether in regard to solubility and reactions. The portion insoluble in chloroform was dissolved in a small quantity of alcohol, and hydrate of potassium added; this produced the separation of a yellowish white precipitate. A crystal of bicarbonate of potassium was added to convert the hydrate into carbonate, insoluble in alcohol. The whole was then shaken with ether, the ether removed and evaporated, leaving a white crystalline residue corresponding to the supposed porphyroxin of the former experiment, and was probably carried down with the resin.

The filtrate (*a*) contained a small quantity of the supposed alkaloid, which was precipitated by Mayer's test. The filtrate was found to be free from tartaric acid, but to contain both citric and malic acids. A portion of the powder, previously exhausted with water acidulated with acetic acid, was then percolated with alcohol, a deep red tincture being obtained. This produced a bright red precipitate with solution of protochloride of tin. A portion evaporated to dryness and treated with water gave a red solution, precipitated by ammonia and Mayer's test, the precipitate being sanguinarina. The residue was a reddish brown resin, soluble in chloroform and ether, giving no characteristic reaction with the mineral acids.

The Volatile Oil of *Origanum Hirtum*. E. Jahns. (*Archiv der Pharm.* [3], xv., 1.) This oil has a reddish yellow colour, an aromatic odour resembling that of oil of thyme, a specific gravity of .951, and a neutral reaction. It is slightly lævo-rotatory. The author found it to contain several terpenes, about 50–60 per cent. of a phenol of the formula $C_{10}H_{14}O$, identical with carvacrol, minute quantities of a volatile acid and of a second phenol, the nature of which could not be ascertained, and a small proportion of cymol. The plant yields nearly 3 per cent. of the oil.

The Resin and Gum of Gamboge. D. Costelo. (*Amer. Journ. of Pharm.*, April, 1879, 174.) Gamboge consists of resin and gum in variable proportions. The amount of resin represents its value both medicinally and as a pigment. Thinking it would be of interest to ascertain the value of the present commercial varieties, specimens of pipe, lump, and powdered gamboge were procured.

Ten grams of each were treated with alcohol until the colour was entirely removed. The gum, which is insoluble in alcohol, was dissolved in cold water, and the solution filtered, to remove insoluble matter. The results are given in the following table :—

In 10 grams of	Resin, grams.	Gum, grams.	Impurities, gram.	Total grams.
Lump	6.76	2.74	.38	9.88
Pipe	7.93	1.945	.015	9.89
Powder	7.66	2.25	.07	9.98

As there is a small quantity of water contained in gamboge, the discrepancy in the above total is attributed to this cause.

The resin was found to be of a bright reddish brown colour, translucent, very brittle, and easily rubbed into bright yellow powder. This is the so-called gambogic acid, $C_{20}H_{23}O_4$. Its solution in alcohol or ether has an acid reaction to test paper, and it unites with bases to form salts.

It is soluble in alcohol, ether, chloroform, bisulphide of carbon, solutions of ammonia and potassa, and partially soluble in petroleum benzine. To form the salts of this acid, the experiments of Johnston and Büchner were followed with slight modifications.

The resin dissolves very readily in warm ammonia water, forming a dark red solution of gambogiate of ammonium. The potassium salt is made by dissolving the resin in solution of potassa, the solution being also dark reddish brown. On standing for some time, a

gelatinous deposit is formed in each of the above solutions. The ammonia deposit was exposed until dry ; the residue left was hard and brittle, insoluble in water, soluble in alcohol and ether, and in appearance resembled the resin.

To form the sodium salt, a portion of the ammonia solution was treated with a solution of chloride of sodium, when a yellow precipitate was thrown down. When the solutions are heated before mixing, the precipitate is much more dense.

Another portion of the ammonia solution was treated with a solution of chloride of barium, when a dark brick-red precipitate of gambogiate of barium was thrown down. The calcium salt is formed by using a solution of chloride of calcium as the precipitant ; the precipitate is of a brownish yellow colour. Both these salts are soluble in alcohol and ether ; on the evaporation of the solutions, the salts are left in the form of a fine powder.

The lead salt was made in a like manner, by precipitating with solutions of neutral and basic acetate of lead ; with the former the precipitate is yellow, while with the latter it is of an orange-yellow colour. These are also soluble in alcohol and ether, and are likewise left in the form of fine powder on evaporation of the solution.

When, to an alcoholic solution of the resin, an alcoholic solution of nitrate of silver is added, no precipitate is formed until after the addition of a small amount of ammonia, when the gambogiate of silver is thrown down as a yellow precipitate ; on exposure to the air this precipitate changes very rapidly, becoming of a dark blackish green colour.

The gambogic acid also forms salts with copper, iron, strontium, etc., by precipitating its solution with a solution of a salt of these metals.

The resin was boiled with strong nitric acid, until red fumes ceased to be given off, and the solution became of a thick syrupy consistence ; on cooling it solidified. This mass was washed with water to remove any free nitric acid ; portions of it were then dissolved in alcohol, ether, and chloroform ; and on the evaporation of the solutions it was left as a light yellow-coloured powder.

The aqueous solution of the gum was boiled with nitric acid, evaporated to dryness, re-dissolved in distilled water, and concentrated. On standing for some time, small crystals were deposited, together with an amorphous reddish brown colouring matter. The mother-liquor was drained off, and the colouring matter dissolved out with alcohol, leaving the crystals colourless and transparent. As

the number obtained was quite small, no satisfactory results could be obtained, other than that they were very soluble in water, insoluble in alcohol, were not entirely volatilized when heated on platinum foil, and had an acid reaction to test paper. The colouring matter, on the evaporation of the alcohol, was of a drab colour, quite bitter; sparingly soluble in water, but quite soluble in alcohol and ether.

Examination of the Seeds of *Camellia Japonica*. M. Katzujama. (*Archiv der Pharm.* [3], xiii., 334.) The seeds, after being freed from their oil by pressure, are exhausted with alcohol, the alcoholic solution precipitated by lead acetate, and the yellow precipitate thus produced decomposed by sulphuretted hydrogen; on evaporation a bluish white powder of bitter taste is obtained, which the author calls *camellin*. This substance is almost insoluble in water, and when boiled with sulphuric acid reduces alkaline copper solutions; it appears by other reactions to resemble digatalin, and has the molecular formula $C_{53}H_{84}O_{19}$. Boiled with dilute sulphuric acid, it yields only a small amount of sugar, showing that it is decomposed only with great difficulty, or else that other substances are produced. The alcoholic filtrate, after separation of the precipitate produced by lead acetate, leaves, when evaporated, a residue of a yellow colour and bitter taste, which contains sugar and tannin, and perhaps another glucoside. The Japanese consider the seeds to be a poison, and the oil was formerly used to oil the swords of Japanese warriors.

Chinese Pear-Galls. C. Hartwich. (*Archiv der Pharm.* [3], xiv., 520.) These galls differ from ordinary Chinese galls in their form and structure. They are pear-shaped, of the size of small plums, and exhibit in their transverse section, next to the epidermis, a layer of tangentially stretched parenchymatous tissue consisting of seven or eight rows of cells. This tangential elongation gradually diminishes towards the centre, where it assumes a radiated appearance. In ordinary Chinese galls this tissue consists of about three rows of cells, which nowhere show a radiated elongation. The amount of tannin in the pear-galls is very large, being 72 per cent. on an average. The author has not been able to ascertain their botanical source.

Mongumo Bark. Prof. Dragendorff. (From a paper read before the Pharmaceutical Society, April 2nd, 1879, and recorded in *Pharm. Journ.*, 3rd series, ix., 816.) At the request of Mr. E. M. Holmes the author undertook the chemical analysis of a sample of this bark obtained from Madagascar, which is said to be used

there as a remedial agent. This drug contains a peculiar yellow colouring matter, and closely resembles in appearance the bark of *Ochrosia borbonica*, of which Mr. Holmes saw a sample among the French colonial products in the International Exhibition at Paris. Nothing is known of its manner of employment or of its medicinal properties.

The following is a summary of the results of Prof. Dragendorff's analysis:—

	Per Cent.
Moisture	16.19
Ash	2.92
Soft Fat and traces of Ethereal Oil . .	0.62
Waxy Substance, traces of Chlorophyll .	1.73
Resin soluble in Chloroform	0.93
Mongumic Acid	23.42
Resin insoluble in Ether, soluble in Alcohol	6.64
Glucoside soluble in Water and Alcohol .	0.61
Substance insoluble in Alcohol and soluble in Water—Mucilage	0.72
Metarabic Acid	0.76
Phlobaphen	0.02
Oxalic Acid in combination with Calcium .	1.73
Mucilaginous Substances (?) soluble in HCl	0.52
Starch and other Saccharifiable Substances	8.08
Cellulose	14.91
Suberin, etc.	16.73
Proteinaceous Substances	3.47

The most important constituent is the one named by the author *mongumic acid*, to which not only the yellow colour of the bark is due, but which can alone explain the medicinal activity of the drug, whatever that may be. The method of obtaining this acid is summarized in the following:—Extraction of the powdered bark with ether free from alcohol, evaporation of the ethereal extract, treatment of the residue with 85 per cent. spirit, and evaporation of the solution after the removal by filtration of the undissolved colourless vegetable wax, solution again of this residue in alcohol of 50 per cent., addition of the ether to the filtered solution, and then of water till the ether again separates out. Under these conditions the mongumic acid is separated with the ether. A further quantity of the acid may be obtained by again shaking with ether, especially if a few drops of acetic acid be added. After the ether has been evaporated off, the mongumic acid is left as a yellow amorphous mass, soluble with difficulty in boiling water, but easily in aqueous solution of ammonia, potassium and sodium hydrate, potassium,

sodium, and ammonium carbonate, and also in lime and baryta water. All these solutions are of a red-brown colour, and yield the acid to ether only when acidulated with acetic or hydrochloric acid; in the latter case easily and completely; and, *vice versa*, the ethereal solution parts with the acid when shaken with an aqueous solution of potassium carbonate. The solution of mongumic acid in spirit of 50 per cent. is coloured black-brown with ferrous and ferric salts; with basic acetate of lead it gives a yellow precipitate; none with neutral acetate of lead, nitrate of silver, or perchloride of mercury; with acetate of copper a brown precipitate. Petroleum ether precipitates the mongumic acid from an ethereal solution, and if the previously-mentioned vegetable wax and fat be present as an impurity, they remain in solution after the filtration from the yellow precipitate. In benzin and in chloroform the mongumic acid is almost insoluble. The alcoholic solution with iodine becomes darker coloured, and with bromine gives a decomposition product difficultly soluble in alcohol. The taste of the acid is bitterish and strongly astringent. By standing several days over sulphuric acid the mongumic acid lost 8.79 per cent. moisture; at 116° C., 9.77 per cent.

Analyses made in the author's laboratory by Mr. Leye gave:—

1. From 0.4452 gram dry substance, 1.0888 gram $\text{C O}_2 = 66.699$ per cent. C, and 0.1925 gram $\text{H}_2\text{O} = 4.80$ per cent. H.

2. From 0.5693 gram, 1.3865 gram $\text{C O}_2 = 66.42$ per cent. C, and 0.249 gram $\text{H}_2\text{O} = 4.86$ per cent. H.

Mean, 66.50 per cent. C, 4.83 per cent. H.

A compound of the formula $x\text{C}_{12}\text{H}_{10}\text{O}_4$ would contain 66.0 per cent. of C, 4.6 per cent. of H, and 29.3 per cent. of O. Owing to want of material; no experiments could be made for determining the actual formula of the molecule.

Kauri Resin. Dr. J. Morel. (From the author's article on "The Turpentine and Resinous Products of the Coniferae," printed in the *Pharm. Journ.*, 3rd series, ix., 676 and 740) The name kauri is applied to several species of *Dammara* occurring in Oceania, and yielding resins that are more or less used. Besides *D. Australis*, which yields the white dammar resin, may be instanced the *D. ovata*, C. Moore, *D. Cookii*, R. Br., and *D. Lanceolata*, Lindl., of New Caledonia, and the *D. Brownii* of Queensland. The greater part of the dammar of commerce comes, however, from *D. Australis*.

Extraction.—At certain seasons of the year there exudes from the lower parts of the trunk of this plant, either spontaneously or assisted by incisions, a yellowish white liquid of good consistence,

which is very viscous, and gives off a pleasant odour of turpentine. This liquid hardens gradually, forming a product of which the colour varies from a milky-white to a pale yellow or even dark brown, thus resembling amber in colour and transparency. Very often it is used by the Maories as a masticatory, although the resin from *D. Australis* has no action either as a stimulant or as a narcotic.

Recent kauri resin is not esteemed in commerce, and only that is exported which is obtained at a distance varying from a few inches to a few feet below the surface of the soil in localities now entirely devoid of trees, being the product of trees destroyed by fire in previous years, or such as has accumulated in the soil at the foot of existing trees as the result of the runnings of many successive years. It is in North Auckland that the greater part of this resin is met with.

Characters.—Hochstetter first pointed out that when kauri resin first runs from the tree it is soft, milky opaque, and has an opaline appearance; it is under this form that it is used as a masticatory by the New Zealanders. In commerce kauri resin occurs in large pieces. The fossil resin is usually pale yellow or greenish yellow, presenting sometimes an opaline lustre; that of inferior quality is of a more or less dirty brown colour. The outside surface is covered with a crust resembling a whitish efflorescence, varying in thickness from that of paper to an inch. Julius Wiesner examined specimens from New Caledonia, and found that some in which the interior portion was thin and whitish, were brownish or even blackish on the outer surface, presenting here and there a metallic aspect. The outer surface is very irregularly indented at the part where the crust separates clearly from the resinous mass. Upon the surface of fracture may be noticed dentate and undulated edges; but frequently the separation between the crust and the resin is not clear, and then description of the surface is not possible.

Kauri resin has a balsamic odour which is very pronounced and characteristic in pieces recently broken or that have been preserved in a well closed bottle. Its taste is aromatic and pleasant; when chewed it is rather adherent to the teeth. It readily melts and dissolves in boiling alcohol and in oil of turpentine. In sulphuric acid it dissolves with a red colour. The sp. gr. of the New Zealand kauri is from 1.062 to 1.109, and that of the New Caledonia is 1.119.

Composition.—According to Thompson, when kauri resin is treated with dilute alcohol, dammaric acid ($C_{40}H_{30}O_7$), a crystallizable

body is separated, while absolute alcohol separates a neutral resin, called dammarane ($C_{40}H_{30}O_6$). According to Muir this resin contains 48 per cent. of matters insoluble in alcohol. Among the 52 per cent. soluble in alcohol, besides resins are small quantities of succinic and benzoic acids. By dry distillation it yields an oily liquid which boils between 155° and 165° C.

Uses.—Kauri resin is used for nearly the same purposes as white dammar. The New Zealanders utilize the property it possesses of diffusing a dense thick smoke, which is condensed and then constitutes the black pigment employed by the Maories in tattooing. It is also used in the preparation of varnishes, which appear capable of rivalling those having copal as a base. For several years the cotton manufacturers have used it to give a gloss to calicoes and other fabrics. About 1865 an attempt was made in London to manufacture candles from it. It is also used to varnish buckets, and, mixed with tar, to cover pallisades. Lastly, kauri resin, having the property of softening when heated, is used in the manufacture of ornaments which resemble amber very well, the resin being softened in moulds.

The Bark of *Carya tomentosa*. F. R. Smith. (*Amer. Journ. of Pharm.*, March, 1879, 118.) In examining hickory bark, collected by himself, the author succeeded in isolating a crystalline principle for which he proposes the name *caryni*, but states that it is identical with *quercitrin*. It was obtained in the following manner:—

An infusion of the bark was treated with solution of lead acetate as long as a precipitate was produced, the precipitate was well washed with water, then suspended in water, and the liquid saturated with sulphydric acid. The sulphide of lead was removed by filtration: and after standing for about twelve hours, the clear filtrate was of a yellow colour, and had deposited a number of small crystals, which were purified by recrystallization from weak alcohol.

The principle thus obtained is soluble in alcohol, and the solution has an acid reaction on litmus paper. It is almost insoluble in cold water, but freely dissolves in boiling water, the solution being of a yellow colour. On filtering its alcoholic solution through animal charcoal, the latter retains the greater portion of the principle. The colour of the solutions is rendered lighter by acids and deeper by alkalis. Ferric chloride added to the solution changes the colour to deep green.

The author determined also the presence in the bark of a small quantity of tannin and sugar. Resin, gum, and starch appear to be absent.

On incineration the bark yielded about 2 per cent. of ash, containing salts of calcium, potassium, and sodium.

The editor of the *American Journal of Pharmacy* adds, that a specimen of the principle presented to him by Mr. Smith showed the usual reactions of quercitrin prepared from the bark of *Quercus tinctoria*, and that when ignited it decomposed without leaving any residue. It was, however, of a darker colour, and had a decided greenish tint. In his opinion, the substance deserves a further investigation.

Anthocercis Viscosa. F. v. Mueller and L. Rummel. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 257.) *Anthocercis viscosa* is a poisonous plant of Western Australia, belonging to the Order *Solanaceæ*. The authors have isolated from it a liquid volatile alkaloid, *anthocercine*, by treating the aqueous extract with alcohol, evaporating the alcoholic solution to dryness, dissolving the residue in water, adding an excess of alkali; then shaking with ether, treating the ethereal solution with water acidulated with hydrochloric acid, again rendering the aqueous solution alkaline, agitating with ether, and allowing the latter to evaporate at a very moderate heat. It is a yellow, alkaline, volatile liquid of oily consistence, heavier than water, of a bitter taste and peculiar, pleasant odour. It is sparingly soluble in water, but freely so in alcohol and ether. Its vapour forms white fumes with hydrochloric or acetic acid. With concentrated sulphuric acid it forms a yellowish brown solution, turning violet on the addition of potassium permanganate. Its acetic acid solution forms precipitates with the usual reagents for alkaloids. With ferric chloride, potassium chromate, and potassium iodide it produces neither precipitates nor colorations.

The physiological properties of anthocercine have not yet been investigated.

Preparations from the Squill. E. Merk. (*Pharm. Journ.*, 3rd series, ix., 1038.) In consideration of the unsatisfactory nature of the so-called "scillitin," which has been looked upon as the quintessence of squill extract, although not perhaps as the pure active principle; and induced by the wish to present the diuretic portion of the squill as the purest possible body and in convenient form, the author has carried out a new examination of the *Scilla maritima*. Up to the present time this has yielded him three substances, which, upon the suggestion of Professor Huseman, of Gottingen, who has made some physiological experiments with them, and Dr. C. Moeller, he has named scillipicrin, scillitoxin, and scillin. Some therapeutic experiments are being made under the care of Dr. Frommüller.

Scillipicrin is a yellowish white amorphous powder, very hygroscopic and very soluble in water, and having a bitter taste. Its solubility in water allows of its subcutaneous injection. It has a definite action on the heart: a slackening of the heart-beats and eventual cessation in diastole is the result of an excessive dose, which with frogs amounts to 0.01 to 0.02 gram.

Scillitoxin is a cinnamon-brown powder, insoluble in water and ether, soluble in alcohol. The solution in alcohol has a lasting bitter and burning taste. The dry substance has a powerfully irritating action upon the mucous membrane of the nose. In aqueous solutions of the alkalies, it is readily, but not absolutely completely dissolved; upon heating the solution in soda ley a peculiar koussin-like odour is developed. Acids produce in these alkaline solutions a flocculent precipitate. When concentrated sulphuric acid is poured upon scillitoxin, first a red, and then a brown colour results; nitric acid produces first a light red and finally an orange-yellow to yellowish green colour. The use of scillitoxin in subcutaneous injection is rendered difficult by its insolubility in water, and this necessitated, in the experiments with frogs, the introduction of the preparation under the skin in the solid state, or mixed with sugar, when the curious observation was made that this substance—insoluble in water—was easily and rapidly dissolved and absorbed.

Scillitoxin also acts upon the heart: it is a decided heart poison, but far more intense in its action than scillipicrin. Whilst, as above mentioned, the minimum lethal dose of the latter for frogs is 0.01 gram, one-eighth of a milligram of scillitoxin suffices to bring the heart to a standstill; but, contrary to scillipicrin, scillitoxin causes the stoppage of the heart in systole. The author thinks that it is probably in scillitoxin that the peculiar active principle of the squill is to be looked for.

Scillin is a light yellow, crystalline, tasteless powder. It is difficultly soluble in water, but soluble in alcohol and boiling ether, from which it again separates in the crystalline condition. Concentrated sulphuric acid colours it red-brown; nitric acid colours it first yellow and then green to dark green, especially when heated. It is contained in the squill in small quantity.

Scillin has of the three substances the least activity. It does not approach the action on the heart of the other two; on the other hand, it appears to produce the subsidiary actions of the squill, such as numbness, vomiting, etc.

The author infers from the foregoing that the first mentioned two

preparations—scillipicrin and scillitoxin—are those worthy of attention, though which will have the advantage as a diuretic in practice must be decided by experiment. But he considers their noteworthy antagonism in paralysing the heart,—the one causing cessation in diastole and the other in systole,—proves without doubt that neither the *extractum scillæ*, the so-called scillitin, nor the squill itself, presents the best means of administration, which can only be obtained by the separation of the active constituents and the simultaneous removal of scillin, the cause of the injurious subsidiary actions.

Myrtle Oil, and its Use in Medicine. (*Journ. de Pharm. et de Chim.*, 1878, 551.) The flowers and leaves of the common myrtle (*Myrtus communis*, L.) contain an essential oil, which, when freshly distilled, is dark-coloured; but by rectification may be obtained colourless, and which possesses in a high degree the odour of the plant. It is lighter than water, and evaporates readily at ordinary temperatures. It boils between 160° and 170° C. On exposure to air it does not become coloured, nor does it resinify, differing in this respect from oil of turpentine. It is soluble in fixed oils and fats, in ether and in alcohol. Applied to the sound skin, it has no effect, but on a denuded surface it produces irritation. It is a carminative stomachic, and may be given as such in doses of about 10 drops. An overdose produces headache, a sensation of fatigue, and prostration. It is an excellent antiseptic, and may render important service in antiseptic surgery.

Notes on Indian Drugs. W. Dymock. (*Pharm. Journ.*, 3rd series, ix., 145, 894, 1015, 1033.) The author has continued his report on Indian drugs. The plants and remedies dealt with during the past twelve months include the following:—

Alhagi Maurorum, Dec. (*Leguminosæ*). The plant and manna. Vernacular: the plant, Jawaśa (Hind. and Bomb.); the manna, Taranjabin (Pers. and Bomb.).

Prunus Bokhariensis, Royle (*Rosacæ*). The fruit. Vernacular: Aloo bokhara (Hind., Bomb. and Pers.); Alpogada pazham (Tam.).

Ammania vesicatoria, Roxb. (*Lythracæ*). The plant. Vernacular: Dad-mari (Hind.); Aginbuti, Guren. Bhar-jambool (Bomb.); Kallurivi, Nirumel-neruppu (Tam.).

Terminalia Bellerica, Roxb. (*Combretacæ*). The fruit. Vernacular: Bhairah, Bahera (Hind. and Beng.); Behara, Yella (Bomb.); Tanrik-kay (Tam.).

Lawsonia alba, Lam. (*Lythracæ*). The leaves and flowers. Ver-

nacular: Mehndee (Hind. and Bomb.); Marutouri, Aivanem (Tam.) Mehedi (Beng.).

Terminalia Chebula, Retz. (*Combretaceæ*). The fruit. Vernacular: Har (Hind.), Hirda (Bomb.), Kaduk-kai (Tam.), Haritaki (Beng.).

Sureya arborea, Roxb. (*Myrtaceæ*). The flowers and bark. Vernacular: Kumbha kummeo (Bomb.); Pootatanni-maram (Tam.).

Momordica Charantia, Linn. (*Cucurbitaceæ*). The fruit. Vernacular: Karela (Hind.); Karla (Bomb.); Pava-kai (Tam.).

Luffa echinata, Roxb. (*Cucurbitaceæ*). The vine and fruit. Vernacular: Kukar-wel (Bomb.). The seeds, Wa-upla-bij (Guz.).

Largenaria vulgaris (Seringe var. *amara*) (*Cucurbitaceæ*). The fruit. Vernacular: Tumbi, Karwee-tumbi (Hind.); Tiktalau (Beng.); Karwa-bopla (Bomb.); Shora-kia (Tam.).

Citrullus vulgaris, Schrad. (*Cucurbitaceæ*). The seeds. Vernacular: Turbuz (Hind.); Tarmuj (Beng.); Turbuj, Kalingar (Bomb.); Pitchapullum (Tam.).

Ecbalium elaterium, A. Richard (*Cucurbitaceæ*).

Apium graveolens, Linn. (*Umbelliferæ*). The fruit. Vernacular: Karafs, Boree-Ajmud (Arab., Hind., and Bomb.).

Pastinaca grandis, Dalz. and Gibs. (*Umbelliferæ*). The fruit. Vernacular: Baphullec (Bomb.); Dookoo (Hind.).

Ferula galbaniflua, Boiss. (*Umbelliferæ*). The gum resin. Vernacular: No Indian names. Jawishir, Gaoshir, Bireez (Pers.).

Alangium Lamarckii, Thwaites (*Alangiaceæ*). The root bark. Vernacular: Dhera, Akola, Ankool (Hind. and Bomb.); Azhinji-maram (Tam.); Dhalakura (Beng.).

Rubia cordifolia, Linn. (*Rubiaceæ*). The root. Vernacular: Majith, Manjit (Hind., Bomb., and Beng.), Manjitti Shevvelli (Tam.).

Nardostachys jatamansi, D. C. (*Valerianaceæ*). The rhizome. Vernacular: Balchar (Hind.); Jatamasi (Bomb., Beng., Tam.),

Blumea aurita, D. C. (*Compositæ*). The plant. Vernacular: Jangli muli (Bomb.); Narak-karandai (Tam.).

Guizotia oleifera, D. C. (*Compositæ*). Expressed oil of the seeds. Vernacular: Ramteel, Kalateel (Hind., Beng., Bomb.); Valesuloo (Tel.).

Glossocardia Bosvallea, D. C. (*Compositæ*).

The Alkaloids of Pomegranate Bark. C. Tanret. (*La Roche Pharm.*, 1879, No. 4.) In addition to the alkaloid pelletierine (see *Year-Book of Pharmacy*, 1878, p. 43, and this volume, p. 38) the author has discovered in this bark three other volatile alkaloids, upon which he intends to report in due course.

Algarobillo. Dr. R. Godeffroy. (*Archiv der Pharm.* [3], xiv., 449.) *Algarobillo* (*Algarrobo de Coquimbo*) is the fruit of *Balsamocarpum brevifolium*, and is gathered in Chili. It occurs in yellowish pods 3-5 centimetres long, and $1\frac{1}{2}$ - $2\frac{1}{2}$ centimetres in diameter, containing up to 6 lenticular seeds, and having a strong astringent taste. The author found as much as 68 per cent. of tannin in the pods, but none whatever in the seeds. He regards this drug as an excellent source for the preparation of tannin.

Smilax Glauca. J. Blankenhorn. (Abstract of an inaugural essay. *Amer. Journ. of Pharm.*, 1879, 298.) With the view of ascertaining the constituents of the long cylindrical, light-coloured rhizome, a sample furnished by Prof. Maisch was submitted to the following treatment:—2 pounds of the ground rhizome were exhausted by a mixture of 2 parts alcohol and 7 parts water, and the percolate concentrated at a low temperature. After cooling, the whole was treated with acetate of lead until no further precipitate occurred, then filtered. The filtrate, thus deprived of nearly all colouring matter, was subjected to the action of sulphuretted hydrogen, in order to free it from lead, and again filtered. The sulphide of lead, after thorough washing with water, was treated with boiling alcohol, filtered, the filtrate concentrated and spread on glass to scale. Attempts were made at crystallization, but without success.

The precipitate with acetate of lead was thoroughly washed, suspended in water, and decomposed by sulphuretted hydrogen, then filtered. The liquid was now evaporated; at first the colour was dark red, and the colour of blue litmus was changed to red. Both characters became greatly augmented as the process of evaporation went on. A small quantity diluted with water gave the following reactions:—With alkalis, the colour was deepened; with ferric chloride, a greenish black colour; with Mayer's test, a yellowish colour; with subacetate of lead, gelatinous precipitate; with solution of gelatin, gelatinous precipitate. These reactions showed the presence of tannin. After concentration to a small bulk, and setting aside for a few days, crystals of what appeared to be a magnesium compound were deposited. The filtrate from these crystals was now treated with twice its bulk of alcohol, filtered, and then found to be free from tartaric, citric, and malic acids. After having been treated with ammonia and solution of alum, no precipitate was obtained with salts of iron, calcium, mercury, and copper, but lead acetate occasioned a white precipitate.

The sulphide of lead remaining after the decomposition of the

lead precipitate by H_2S was thoroughly washed and treated with boiling alcohol, filtered, and allowed to evaporate spontaneously; then spread on glass to scale. The product was of a beautiful red colour, perfectly transparent, taste slightly bitter, wholly soluble in alcohol and partially so in water, but insoluble in ether and chloroform. Ammonia dissolved it, deepening the colour, and on the addition of an acid the colour was discharged. A small quantity dissolved in water with the aid of alcohol, and agitated, produced copious foaming, and was precipitated by acetate of lead. On digesting with water, a portion was dissolved, and on being evaporated was left behind as a red transparent mass; the portion insoluble in water dissolved in alcohol, and after evaporation left a brown transparent mass, both portions foaming on being agitated with water.

The filtrate, after precipitation by acetate of lead, left, on evaporation, an amorphous, dark, red-brown mass, with a tint of green, and perfectly transparent; the taste is very bitter and slightly acid. It is freely soluble in alcohol and water, but insoluble in ether and chloroform. With strong sulphuric acid it produces an orange-red coloration changing to brown.

The presence of starch, sugar, albumen, resin, and pectic compounds was also noticed.

The Wax of Ficus Gummiiflua. F. Kessel. (*Archiv der Pharm.* [3], xiv., 284.) This wax is used by the natives of some districts of Java. It is brittle, of a chocolate-brown colour, and yields its colouring matter to boiling water so completely that, after repeated treatment with the latter, it becomes almost white. Ether separates it into two parts, one of which is difficultly soluble, and the other readily soluble in that menstruum. The former amounts to about 5 per cent. of the raw wax, fuses at 62°C ., and answers to the formula $\text{C}_{27}\text{H}_{56}\text{O}$. The portion which is readily soluble in ether, crystallizes from a mixture of ether and alcohol in small warty crystals, fusing at 73°C ., and having a composition represented by the formula $\text{C}_{15}\text{H}_{30}\text{O}$.

PHARMACY.

PART III.

PHARMACY.

Magnesia as an Antidote for Arsenic. P. de Clermont and J. Frommel. (*Répertoire de Pharm.*, 1878, 402.) Magnesia has long been known as an antidote to arsenic, and has been favourably regarded as such by many. The author, however, shows that it fails if the arsenic be contained in the stomach or the intestines in the form of trisulphide; and this, he contends, may occur though the poison administered was arsenious acid. The conversion of the latter into the trisulphide in the viscera has also been noticed by Buchner (*Neues Repert.*, 1868, 386.) The action of magnesia on the trisulphide results in the formation of soluble magnesium sulpharsenite and insoluble magnesium arsenite,—



If therefore the arsenious acid administered has been partly converted into trisulphide by the time the magnesia comes into contact with it, the effect of the latter will be to convert the insoluble trisulphide into a soluble poisonous combination, and thus to defeat the very object for which the magnesia was intended.

The author does not deny the value of magnesia as an antidote to arsenious acid which has not undergone the change referred to.

Saccharated Extracts. C. S. Hallberg. (*Chicago Pharmacist*, 1879, 201.) The value of sugar of milk in the administration of remedies has suggested its application as a substitute for any other preservative and vehicle. It possesses these clearly recognised advantages in a therapeutical point of view:—

It does not ferment in the stomach. It does not precipitate the pepsine and albuminous matter in the gastric juice.

It promotes rapid assimilation, and is not objectionable where an alcoholic medicine would be contra-indicated.

The following is an outline of the simple process for a preparation of the same strength as a fluid extract:—

Exhaust sixteen troy ounces of a crude drug; evaporate to a solid extract; carefully dessicate and mix the same with sufficient sugar of milk to bring the whole when powdered to sixteen troy ounces.

During the operation the percentage of solid extract should be noted, and in the case of the more powerful remedies an estimation of its alkaloids resorted to.

The advantages of these extracts over ordinary fluid extracts appear to be the following:—

They will be of uniform and known strength, and therefore capable of being prescribed with great accuracy and precision.

In cases where even a small proportion of alcohol would be objectionable, the extracts will be found of the utmost value, the sugar of milk readily helping in the assimilation process.

The advantages over the ordinary solid extracts are various, and suggest numerous applications, by reason of the minute state of division induced by the trituration of the sugar of milk with the drug.

1. They are stable at all temperatures and under all conditions; they will not swell, ferment, or waste.

2. They are always of a uniform and convenient consistence, and are not open to the objection of becoming again solid, as the powdered extracts do.

3. Their divisibility is always effected instantaneously, which is very desirable, as saving time and insuring accuracy in dispensing.

This form of extracts would be adapted to the filling of empty capsules, and also to be made into compressed pills, the sugar of milk making the mass adhere, and its crystalline nature favouring the disintegration of the pill in the stomach and inducing rapid osmosis.

In the same manner troches can be formed of the more mild remedies, such as gentian, taraxacum, rhubarb, senna, or various combinations of the same.

In dispensing small quantities of the more powerful remedies in prescriptions, the use of these triturated extracts will be very serviceable in saving time as well as insuring accuracy in weighing, the small amount of sugar of milk not being objectionable.

Sodium Copaivate as a Therapeutic Agent. Drs. Zlamál and Roquette. (*Pharmaceut. Centralhalle*, Oct. 3, 1878, 374.) Examinations of the urine of numerous patients taking copaiba led M. Roquette to the conclusion that this oleo-resin owes its therapeutic effects to the acid resins contained therein, and in no measure to the essential oil and amorphous resins. These resin acids, during their passage through the organism form combinations with the alkalis, and it is to the presence in the urine of the salts thus formed, that the healing action of copaiba is attributed.

These observations have induced Dr. Zlamál to try the effects of pure copaivic acid and of alkaline copaivates, with results fully justifying his anticipations, and proving sodium copaivate to be a safe and reliable remedy, effecting a speedy cure in cases of gonorrhœa and similar affections. The preparations experimented with by Dr. Zlamál were made for him by G. Lucich. The copaiva was distilled with water to remove the volatile oil, the residual mixture of Alpha and Beta resins treated with purified petroleum, the solution evaporated and the residue freed from Beta resin by repeated crystallization from strong alcohol. Copaivic acid thus prepared formed white prismatic crystals, becoming opaque on exposure to the air. Its sodium salt, $\text{Na C}_{20} \text{H}_{29} \text{O}_2$, was made by combining equivalent quantities of the acid and sodium hydrate, and obtained in the form of a white crystalline powder. This preparation is recommended by M. G. Lucich to be mixed with half its weight of dextrine and made into pills with mucilage. These pills, when sugar-coated, form an elegant, efficient, and in every sense unobjectionable remedy. The pills contain nearly two-thirds of their weight of sodium copaivate, and one part of this salt corresponds on an average to three parts of copaiva, from which proportion the dose may be readily calculated.

The Alleged Decomposition of Calomel by Sugar. H. W. Langbeck. (*Pharm. Journ.*, 3rd series, ix., 46.) The *Bunzlauer Pharmaceutische Zeitung* contains, in No. 39, a notice taken from the "Osservatore Med. Siciliano" i. and ii., 1877, by which attention is called to the possible danger in keeping subchloride of mercury mixed with sugar, the mixture containing, after some time, perchloride of mercury, as proved by chemical analysis.

According to the author's experience, no such decomposition is likely to occur if perfectly dried sugar and well washed calomel are used, and if the mixture is kept in a stoppered bottle protected from the light. He thinks that perchloride of mercury not unfrequently pre-exists in the calomel used for such mixtures, and records the results of his analysis of three commercial examples of this substance, all of which proved to contain appreciable quantities of the perchloride.

The Decomposition of Calomel in Mixtures with Sugar and other Powders. Dr. Vulpius. (*Archiv der Pharm.* [3], xiv., 347.) The author's experiments lead to the following conclusions:—

No bichloride is formed in the course of twenty-four hours in mixtures of calomel with sugar, milk sugar, magnesia, carbonate of magnesia, and bicarbonate of soda.

No decomposition takes place within three months in mixtures of calomel with magnesia, carbonate of magnesia, and sugar.

Traces of bichloride are found after three months in a mixture of calomel, bicarbonate of soda, and sugar of milk; and a larger quantity is detected after the same time, if the mixture contained cane sugar instead of sugar of milk.

Calomel powders, containing magnesia or sodium bicarbonate alone, will contain corrosive sublimate if digested with water.

The formation of corrosive sublimate in mixtures of calomel and alkalis digested in water for a short time is not favoured, but on the contrary prevented, by the presence of hydrochloric acid in the water; the acid neutralizing, to a certain extent, the alkalis which cause the formation.

Note on Easton's Syrup. W. Gilmour. (*Pharm. Journ.*, 3rd series, ix., 713.) The washing of the precipitated quinine, in the preparation of this syrup, results in a loss of this alkaloid, which causes its actual amount contained in the syrup to be less than it is represented to be. The experiments conducted by the author on this subject show that .9 grain and not 1 grain is the quantity of quinine phosphate really contained in 1 fluid dram of the syrup.

Vaseline as a Solvent of Iodine. G. Selle. (*Pharmaceut. Zeitung*, 1879, No. 22. From *New Remedies*.) The author draws the attention of physicians and pharmacists to the undoubted advantages of vaseline as a body for various ointments, and defends it against the attacks of various writers of authority, who have raised objections against it. Among other things it has been stated that vaseline is not only not absorbed by the skin, but that it also prevents the absorption of remedies which are mixed with it. The author found that 20 parts of vaseline dissolve 1 part of iodine. A small quantity of this solution (0.5 gram) was rubbed into the lower arm night and morning. The urine collected during the thirty-six hours succeeding the first inunction showed the usual reactions for iodine, proving thereby that the latter had been absorbed.

The solution of iodine (1 part) in vaseline (20 parts) is soluble in cod-liver oil and other oils in every proportion, and may even be mixed with extract of malt. The internal administration of vaseline appears to be entirely harmless, as no report of any injury caused by it has so far been published.

Emplastrum Plumbi. J. Mueller. (*Pharmaceut. Zeitung*, 1879, 70.) The author prefers the following process to those usually employed:—

Melt 7,500 grams lard with 7,500 grams olive oil in a large copper

kettle, and add immediately 3 litres hot water; then add through a sieve, stirring constantly, 7,500 grams litharge, previously heated until entirely free from carbonic acid (*i.e.* until a little mixed with nitric acid causes no effervescence). Allow the mixture to stand over night, and boil the plaster in the morning for from two to two and a half hours with a moderate heat, without adding any water.

Notes on the Analytical Examination of Tinctures. A. H. Allen. (From a paper read before the Society of Public Analysts, April 30, 1879. *Analyst*, June, 1879.) The officinal tinctures are made either with rectified spirit of 838 sp. gr., containing 84 per cent. by weight of absolute alcohol, or with a diluted spirit of proof strength, having a sp. gr. of 920, and containing 49 per cent. of alcohol. Very frequently the rectified spirit sold to druggists and used by them in the same condition in which it is bought, is 60° instead of 56° over proof, so that tinctures made with such a spirit in the usual proportions, will be found on analysis to contain a percentage of alcohol slightly in excess of the proper amount. In many other instances, however, the cost of tinctures is reduced, by an undue proportion of water in the spirit employed, and in the majority of such cases this reduction of cost cannot be effected without a simultaneous reduction of quality.

In many of the officinal tinctures the determination of the alcohol presents no difficulty. Mere distillation will suffice to separate it in a state of approximate purity from the tinctures of aconite, arnica, belladonna, calumba, capsicum, catechu, jalap, nux vomica, opium, quinia, etc., and the same is true of the tinctures of iodine, ferric acetate, etc., if they first be rendered distinctly alkaline with caustic soda. On the other hand, the tinctures of benzoin, myrrh, ginger, camphor, rhubarb, etc., give a distillate contaminated with essential oils or similar volatile matters in quantity sufficient to affect, more or less seriously, the determination of alcohol by the density. The same is true of the "aromatic spirit of ammonia," and tinctures prepared with it, with the additional objection that the distillate will contain ammonia, unless the alkaline reaction of the spirit be previously carefully neutralized by hydrochloric acid.

If any of the tinctures to which the distillation process is not directly applicable be diluted considerably with water, the essential oil is precipitated more or less completely, but usually in so fine a state of division that filtration is perfectly useless. The author finds, however, that this difficulty may be got over very simply by operating in the following manner:—50 c.c. of the sample are taken and diluted with water to about 350 c.c. This causes the precipitation

of the greater part of the essential oil or resinous matter. A few drops of a strong solution of calcium chloride are next added, and this is followed by some solution of sodium phosphate, the liquid being vigorously stirred. The flocculent precipitate of calcium phosphate effectually entangles the finely divided essential oil, and clarifies the liquid. The liquid is next diluted to a definite volume, 400 c.c. being sufficient if the tincture were prepared with proof spirit, but 500 is preferable if rectified spirit should have been originally employed. The solution is then thoroughly agitated and passed through a dry filter. A known measure is then carefully distilled at a low temperature, and the distillate made up exactly to the volume occupied by the liquid before distillation. The density of the distilled spirit is then taken, and the corresponding percentage of proof spirit learnt by reference to a table. Evidently the proportion of proof spirit in the original tincture will be either eight or ten times the amount found in the distillate, according to the extent of dilution practised.

It is convenient to state the strength of the tincture in percentages of proof spirit, as any deficiency in strength is then at once apparent, and the extent of dilution is readily calculated.

The following data indicate the extent to which the process may be relied on.

A sample of tincture of myrrh was prepared according to the directions of the Pharmacopœia, and on examination gave the following results:—

	Sp. Gr.	= Proof Spirit by volume.	= Absolute Alcohol by weight.
Spirit used for preparing			
Tincture	·8378	156·7	84·1
Tincture	·8519	146·0	77·3
Spirit in Tincture calcu- lated from results of distillation		150·7 151·0	80·8 80·9

It would appear from these results that about 6 per cent. less of proof spirit was obtained than was present in the alcohol used in preparing the tincture, and, therefore, that the method is in error to this extent. This conclusion is not justified, for in the above calculation it is assumed that no increase in the bulk of the spirit occurs on saturating it with myrrh; but the following data show that this assumption is not warranted:—5 grams of myrrh previously dried at 100° C. were added to 40 c.c. of rectified spirit of ·8280 specific gravity. After standing forty-eight hours, the tinc-

ture was filtered, the residue washed with a little spirit, dried, and weighed. Its weight was 3.142 grams, so that 1.858 gram had dissolved in the spirit. The density of the tincture was found to be .8432. The weight of alcohol used was $.828 \times 40 = 33.120$ grams, which, added to the weight of the dissolved myrrh, gives 34.978 as the weight of the tincture. This, divided by the observed density, gives 41.4 c.c., as the measure of the tincture. Hence 100 c.c. would have increased to 103.5 c.c. In another experiment the volume was found to be 103 c.c., and in a third experiment, on double quantities, it came to 104.6. The mean of these estimations is 103.7. Thus the percentage of alcohol *found* in tincture of myrrh ought to be multiplied by 1.037 to get the true strength of that *employed* in its preparation. Applying this correction to the alcohol found by distillation of tincture of myrrh, we obtain 156.2 and 156.6 per cent. of proof spirit, against 156.7 employed in preparing the tincture, a result which leaves nothing to be desired.

A very striking example of expansion of the fluid occurs in the preparation of the "spirit of camphor, B. P." In one experiment the author placed 10 grams of camphor in a graduated cylinder, and added 90 c.c. of rectified spirit of .830 specific gravity. The tincture produced measured exactly 100 c.c., so that, as camphor has a density of .996, 10 grams would measure 9.96 c.c., and hence camphor dissolves in alcohol without sensible change of volume. The tincture was found by experiment to have a density of .8446, the theoretical density, assuming no change of volume, being .8466. Therefore the action of alcohol on camphor appears not to be strictly that of a solvent. It seems to act rather by causing liquefaction of the camphor, subsequently mixing with the resultant liquid without notable change of volume. Its action may be compared to that of chloral hydrate or camphor.

In consequence of this peculiarity, the proportion by volume of proof spirit contained in spirit of camphor will be nine-tenths of that present in the alcohol used in its preparation; and there is no doubt that a similar correction ought to be applied in certain other cases.

When the modified distillation process already described is applied to spirit of camphor, the determination of the alcohol can only be effected approximately. Even when the spirit is previously diluted with nine times its volume of water, the distillate has a distinct smell and taste of camphor.

It is very probable that Monell's colorimetric method (*Journ. Chem. Soc.*, 1878, ii., 246) might be advantageously utilized for the

estimation of alcohol in spirit of camphor, but the author has not tried the experiment.

The remainder of the author's paper deals with the examination of one tincture in particular, viz., *tinctura camphoræ composita*. The spirit strength of this tincture may, with fair accuracy, be deduced direct from the specific gravity, without previous distillation. If there be any deficiency of alcohol, there must necessarily also be a deficiency of oil of anise, as any spirit under proof strength fails to dissolve the entire quantity of the oil. A copious separation of oil should occur on adding water to the tincture. A sample of this tincture, submitted to the author for analysis by an inspector appointed under the Sale of Food and Drugs Act, was found to form clear mixtures with water in any proportion, and therefore could not contain more than a mere trace of this constituent (oil of anise). The same sample did not appear to contain any benzoic acid whatsoever. This acid may be readily detected and estimated in the tincture in the following manner:—A sample of the tincture, when evaporated with the addition of a little alkali to half its volume, should give an immediate and copious precipitate of benzoic acid on being strongly acidified with concentrated hydrochloric acid. If the acid liquid be then shaken with ether, and the upper layer of liquid removed with a pipette, the benzoic acid is readily obtained in a fairly pure condition. By transferring the ethereal layer to a small beaker, and evaporating the ether spontaneously by a current of dry air from an aspirator or bellows, the benzoic acid remains as a crystalline residue, which may be further examined. If the shaking with ether be repeated, and the extraction of benzoic acid is perfect, a very fair approximate determination of its quantity may thus be obtained, even on as small a quantity as 5 c.c. of the tincture. Chloroform may be used in the place of ether.

A very fair idea of the proportion of opium present in compound tincture of camphor may be obtained by diluting the sample with proof spirit and adding ferric chloride. By comparing the depth of red colour produced with that given by a standard tincture, in a manner similar to Eggertz' colorimetric method of determining carbon in steel, a good approximation to the proportion of opium can be obtained. Of course, the percentage of meconic acid contained in different samples of opium is somewhat variable, and hence the determination is but approximate. A useful check is obtained by drying up a known measure of the tincture, until the residue ceases to lose weight, provided the tincture has not been artificially coloured by caramel or some similar material.

A New Mode of Preparing Solution of Perchloride of Iron. E. B. Shuttleworth. (*Canad. Pharm. Journ.*, February, 1879.)

The process consists in reversing the ordinary operation,—adding the iron solution to the nitric acid instead of the acid to the iron. If the specified quantity of nitric acid be placed in a dish or pan, and the iron solution, mixed with the proper quantity of hydrochloric acid, be allowed to trickle slowly into it, the oxidation is instantaneous in the cold, and the frothing very slight. The change from blackish green to reddish brown is very marked, and any deficiency in the quantity of nitric acid can be at once seen. When working on a large scale the liquor is best added with a syphon. With a bent glass tube of five-sixteenths of an inch in diameter, the liquor from ten pounds of iron may be run in safely in twenty-two minutes, and requires no attention whatever, save in getting the syphon in operation. With pharmacopœial quantities of material the process of oxidation may be concluded in almost as many seconds.

The final concentration may be performed in a water bath, and in this case earthenware vessels may be used, but of course the evaporation is much more rapid with the naked flame on a sand bath; but a high degree of heat is not at all necessary in making this preparation.

The great advantage of this process consists in the fact that the conversion of the ferrous salt into the ferric is conducted entirely without heat.

Liquor Arsenicalis. J. Mueller. (*Pharm. Zeitung*, 1879, 112.) For the preservation of Fowler's solution, the author suggests the addition of 0.4 gram of borax to 100 grams of the solution. This, he finds, will prevent the partial decomposition to which this preparation is liable, and which the author attributes to the presence of organic matter, emanating either from the water or the filtering paper employed.

Extract of Malt. W. R. Dunstan and A. F. Dimmock. (*Pharm. Journ.*, 3rd series, ix., 734.) The following table includes the results of the examination of a number of trade samples of extract of malt. The albuminoids were calculated from the results of nitrogen combustions in the usual manner. The authors hope at some later date to be able to determine which of these albuminoids are coagulable and which amidic. Phosphates were determined in the ash as pyrophosphate of magnesium. The maltose was estimated by a standard solution of cupropotassium tartrate. The dextrin was estimated by boiling a solution of the malt extract

with dilute sulphuric acid and estimating the sugar present by the cupropotassium solution as glucose—for maltose and dextrin are both convertible into glucose by ebullition with dilute sulphuric acid—calculating the glucose into maltose, then subtracting from the whole the amount of maltose found before boiling with dilute acid, and calculating the remainder into dextrin. The starch converting power of the extracts was found by the authors' process, described in this volume, page 65. The authors draw particular attention to the fact that this process trustworthily shows the relative value of different samples of malt extract, inasmuch as it accurately indicates the point at which the last traces of starch are converted. Large quantities of diastase, and therefore large quantities of malt extract, are necessary to effect this entire conversion of every trace of starch; whereas, as is well known, very small quantities of diastase, and therefore very small quantities of malt extract, will convert relatively large quantities of starch into a liquid condition, that is, will practically digest large quantities of starchy foods. Such a result, useful enough for purposes of digestion, but not sufficiently sharp for analytical purposes, is obtained by using the pudding process, which the authors described in a previous paper, and which was tried as a rough indication of the presence or absence of diastase on all the extracts which they examined.

Results of Examination of Trade Samples of Malt Extract.

Constituents.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Water (100° C.)	61.3	67.6	32.0	27.0	19.6	20.6	19.4	31.9	24.2	19.0	81.5	30.2	86.3	20.0
Ash	1.0	1.2	1.2	1.2	1.1	1.6	1.4	1.1	1.6	1.1	0.1	1.1	0.3	1.5
Maltose . . .	26.3	16.9	41.8	53.0	67.0	18.7	50.0	53.8	59.0	28.9	1.6	44.4	4.6	50.4
Dextrin . . .	2.5	3.9	5.2	9.8	5.1	6.2	9.1	5.9	9.0	7.2	3.1	5.7	3.1	8.5
Albuminoids .	0.3	6.2	6.1	6.3	7.7	5.9	8.2	6.3	6.2	6.3	1.6	4.0	0.5	5.0
Phosphates as Phosphoric Pentoxide .	0.3	0.3	0.3	0.4	0.5	0.2	0.5	0.2	0.3	—	0.1	0.3	0.6	0.5
Grams of Extract required to convert one gram of Starch . . .	—	—	—	—	17.3	—	—	—	29.0	—	—	—	—	34.0
Alcohol . . .	—	—	—	—	—	—	—	—	—	—	—	—	1.1	—

Hypophosphite of Zinc. R. W. Gardner. (*Druggists' Circular and Chem. Gazette*, from *Med. Record*.) The object of the author's paper is to draw attention to the value of hypophosphite of zinc as a remedial agent.

The only combination of phosphorus and zinc heretofore in use is a phosphide of zinc, of the formula $P_2 Zn_3$, which consists of phosphorus and metallic zinc in the proportion of one part of the former to about six parts of the latter, and contains both in an unoxidized state. As no oxygen enters into its combination, the phosphorus produces the same irritant effect in the stomach as if given in the free state, its irritant action being caused by its oxidation. The ordinary dose of phosphide of zinc is one-tenth of a grain, which cannot be largely increased. The proportion of zinc contained in this quantity is too infinitesimal to prove a useful nervine tonic, while the proportion of phosphorus is much less still.

The author therefore proposes the use of hypophosphite of zinc of the formula $Zn (P H_2 O_2)_2, 4 H_2 O$. In this salt both the zinc and phosphorus are in a protoxidized state, in which condition the phosphorus is rendered non-irritant, admitting the use of such quantities as to fully meet all indications for either phosphorus or zinc. The salt being perfectly soluble is at once assimilated, while both elements in the phosphide must be oxidized previous to assimilation; its advantages in most nervous diseases over zinc oxide, zinc sulphate, etc., being that the very desirable effects of phosphorus in its best condition for assimilative action are also available by its use. The condition of absolute purity is essential to this, as to all hypophosphite salts, for unless used in this condition their therapeutic effect is either very much impaired or wholly lost.

In the author's opinion a syrup containing eight grains of the salt in one fluid ounce, is the most suitable form for its administration, as the sugar is an efficient preservative against atmospheric influence, and renders the preparation more palatable. The dose of this syrup is one to two fluid drams three times a day.

A Drying Closet. T. E. Greenish. (*Pharm. Journ.*, 3rd series, ix., 81.) An excellent description is given by the author of a drying closet particularly well suited for pharmaceutical laboratories. The description is illustrated by woodcuts, for which, as well as for the details of the description, we refer our readers to the original article.

Unguentum Hydrargyri. Dr. R. Godeffroy. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 104.) The author recommends petroleum jelly, hardened with a little paraffin, as an excellent substitute for the mixture of lard and suet in the preparation of mercurial ointment. The extinction of the mercury by means of this preparation is readily effected in a short time, the best proportions for this purpose being 1 part of the jelly to 10 parts of mercury. The

remainder of the jelly is added after globules of mercury are no longer discernible.

Milk as a Solvent of Quinine. R. L. Batterbury. (From *Pharm. Journ.*, 3rd series, ix., 73.) The author calls attention to the fact not generally known, that milk is not only a good solvent of quinine, but that it also disguises its bitterness. He states that if one grain of the sulphate be dissolved in an ounce of milk, the solution is scarcely perceptibly bitter; whilst two grains dissolved in the same quantity do not make it markedly bitter. A dose of five grains may be taken in two ounces of milk without rendering it very unpleasant, and if this be thrown into a tumblerful of milk, the bitterness all but disappears. The method appears to present especial advantages in administering quinine to children.

The suitability of milk for this purpose has since received confirmation; and Mr. Palmer, resident surgeon of the Birmingham General Dispensary, recommends the use of a solution of quinine in glycerin, in the proportion of one grain to one dram, the dose being given in a wineglassful of milk.

A New Minim Pipette. C. W. Drew. (*Amer. Journ. of Pharm.*, March, 1879.) This pipette is of novel construction, consisting of a graduated minim tube placed within a larger tube of about half the length of the former. A short section of rubber tubing connects the two at the lower part of the larger and at the middle of the smaller, along which it may be moved. By immersing the point of the graduated tube in a liquid, closing the upper part of the larger tube by the thumb, and sliding the outer tube up, the liquid is drawn into the graduated tube as though the mouth were applied, and without the inconvenience and annoyance usually attending this mode of operating.

A woodcut illustrating the subject will be found in the original article.

Cod Liver Oil Emulsion. W. Gilmour. (*Pharm. Journ.*, 3rd series, ix., 773.) Of all the excipients suggested by different authorities for emulsifying cod liver oil, the author considers gum tragacanth to be the best. Let 3 drams of the finest white powdered tragacanth be rubbed up in a large mortar with 3 ounces of glycerin. To this add as much boiling water as will convert it into a thick transparent jelly, from 8 to 10 ounces being probably required. After cooling add the cod liver oil, which should first be mixed either with plain water or lime water, in the proportion of one of the latter to three of the oil; or if, as is customary,

the emulsion is intended to contain the hypophosphites of lime or soda, let these be added to the plain water previous to mixing with the oil; and then let this primary emulsion be gradually added to the mucilage of tragacanth with constant stirring. In the process of mixing, the emulsion not only creams, but also thickens up to a certain point, and individual taste must settle the extent to which the mixture may be carried. The author finds the 3 drams of tragacanth emulsify from 50 to 80 ounces of what he calls the primary emulsion, the former quantity being very thick and not easily poured from the mortar, the latter quantity flowing more freely, and forming what he considers the better emulsion. In mixing the oil with the mucilage of tragacanth, care must be taken not to add it too hurriedly, else it will not emulsify. The mixture will simply break up into a clotted mass, and no amount of labour apparently will bring it back to the emulsified form. Under these circumstances, the better way is at once to begin again with a small quantity of fresh mucilage, to which the clotted mass should be carefully added by degrees. In this way only can the emulsion be brought back to its proper form.

As a suitable means of flavouring the emulsion, the author recommends the addition of oil of bitter almonds, in the proportion of two drops of the oil to each ounce of cod liver oil. He prefers bitter almond oil containing hydrocyanic acid to that which has been deprived of it.

Unguentum Diachylon. Dr. Vulpius. (*Pharmaceut. Zeitung*, 1879, 151.) The following formula is recommended by the author as the best for the preparation of this ointment:—1 kilogram of litharge in fine powder is heated with 4 kilograms of olive oil and a sufficient quantity of water until the reaction is completed. After straining, and when nearly cool, 50 grams of oil of lavender are incorporated with the ointment. This process is said to be the one adopted in Prof. Hebra's clinic at Vienna, and to yield a preparation superior, in every respect, to that prepared according to the directions of the German Pharmacopœia.

Oleic Acid and the Oleates. L. Wolff. (*Amer. Journal of Pharm.*, 1879, 8.) The writer places little confidence in commercial oleic acid, and recommends that it be prepared from almond oil with lead oxide, as in the officinal process for lead plaster, and washing with benzine to separate the lead palmitate from the lead oleate. The benzine solution is then shaken with dilute hydrochloric acid, which forms lead chloride and leaves the oleic acid in solution. This should be of a pale yellow colour,

soluble in 92 per cent. alcohol, should not give a dark precipitate with ammonium hydrosulphate, nor congeal when cooled to 32° .

He gives formulæ for preparing some oleates, which is to dissolve the drug in the acid at a moderate heat. Usually the metallic oxides, or in some instances the metal itself, is employed. He suggests making oleates of the alkaloids, and thinks they are destined to hold an important place in medicine. The alkaloids combine so readily with this acid, that the author suggests its use in obtaining the various alkaloids in lieu of more expensive processes.

Fluid Extracts by Repercolation. E. R. Squibb. (*Pharm. Journ.*, 3rd series, ix., 167, 184, 286, 347, 450, 601, 854, 1039.) An elaborate series of articles, which since its completion has been re-published in the form of a pamphlet. Not suited for abstraction.

Test for the Purity of Olive Oil. M. Poutet. (*Chemiker Zeitung*, 1879, No. 5.) The test recommended is a solution of mercurous nitrate prepared by dissolving 6 grams of mercury in 7.5 grams of nitric acid (of 36° to 48° B.) without heat. 96 grams of the oil to be tested are mixed with 8 grams of this mercurous solution, and the whole shaken every ten minutes for two hours, after which the mixture is allowed to settle for twelve hours. The elaidin thus formed will be pale yellow and quite firm if the oil was pure; while in the case of adulterated oil, it will be orange or dark red, and only partially solid, or not solid at all. Oil of sesame may be detected in olive oil by shaking 2 parts of the suspected sample, at a temperature of 20° to 25° C., with 1 part of pure hydrochloric acid of 22° B., in which 0.05 to 0.1 gram of sugar has been previously dissolved. The oil which separates upon standing will show a distinct pink colour if sesame oil was present. The greater or lesser intensity of the coloration indicates the extent of the adulteration.

Examinations of Commercial Specimens of Scammony. J. Woodland. (*Chem. and Drugg.*, Feb., 1878, 76.) The author's examination of ten commercial samples of this drug gave the following results:—

Six samples contained large proportions of starch.

Two samples contained only traces of starch.

Seven samples contained 5 to 12 per cent. of ash.

Two samples contained no starch, and only small percentages (3 to 3.5) of earthy matter.

He found no jalap, common or guaiacum resin present in any of

the samples. The starch granules, when seen under the microscope, were identified as those of wheat.

On estimation to ascertain the percentages of resin present, the following were the results :—

One sample contained 58 per cent. of resin.

Two samples contained respectively 69 and 75 per cent.

Five samples contained from 76 to 80 per cent.

Two samples contained respectively 81 and 83 per cent.

The percentages of resin were ascertained by boiling a weighed quantity of the sample in a test-tube with ether, pouring off the clear liquid on to a weighed filter paper (previously moistened with ether), again boiling the residue with ether, pouring this clear liquid on to the weighed filter, and repeating this process a third time; the filter paper was then washed with ether, and the filtered ethereal liquids containing the resin having been received into a weighed vessel, the ether was evaporated by a gentle heat, and the increase in weight of the vessel noted. The filter paper was then dried, and the increase in weight noted. The filter paper was weighed in order to confirm the percentage of resin obtained, the increase in weight of the filter and weighed vessel equalling the amount of the sample taken.

Scammony, it is stated, should form a white emulsion with water, but in the cases of the seven which yielded from 5 to 12 per cent. of ash the emulsions had a very dirty appearance.

A Mistura Guaiaci in Clear Solution. B. Squire. (*Pharm. Journ.*, 3rd series, ix., 894.) The author points out that tincture of guaiacum forms a clear mixture with glycerine, and that, given in this form, the necessary bulk of the dose of the tincture may be much diminished. He uses a rectified spirit tincture in the place of the ammoniated tincture of the Pharmacopœia, and suggests the admixture of half a dram or a dram of this tincture with one or two drams of glycerine for a dose. The mixture does not bear dilution with water without a separation of the resin. If it is to be diluted, glycerine should be used instead of water.

Scheme for the Valuation of Dover's Powder. A. B. Prescott. (*Amer. Journ. of Pharm.*, Dec., 1878, 561.) The process is as follows :—

The powder is made alkaline and agitated with several portions of benzol. The emetine and narcotine are dissolved, the morphia is not dissolved (more than a *trace*) from alkaline solutions by benzol. The benzol solution is concentrated, and the alkaloids extracted with acidulated (sulphuric acid) water; this solution is made slightly

alkaline with ammonia, and agitated with several portions of petroleum naphtha (sp. gr. 725). The petroleum naphtha is concentrated and treated with acidulated (sulphuric acid) water. The acidulated water solution is treated with Mayer's solution, 1 c.c. of which precipitates 0.0189 gram of emetine. The alkaline solution, after agitation with petroleum naphtha, is made slightly acid (sulphuric) and titrated with Mayer's solution, 1 c.c. precipitating 0.0213 gram of narcotine. The residue, after treating the powder with benzol, is treated several times with amylic alcohol, filtered, and the filtrate evaporated to dryness and weighed as *crude morphia*. This is then redissolved in acidulated (sulphuric) water, filtered, and the filtrate titrated with Mayer's solution, 1 c.c. precipitating 0.020 gram of morphia.

The method is tabulated as follows:—

The dry powder is moistened with ammonia and shaken with several portions of benzol.

RESIDUE, containing <i>morphia</i> , indeterminate and inorganic matter, etc.	SOLUTION, containing <i>emetine</i> , <i>narcotine</i> , and perhaps some indeterminate matter.	
Agitate with several portions amylic alcohol; separate, evaporate the amylic alcoholic solution to dryness, and weigh as <i>crude morphia</i> . Dissolve in acidulated water, filter, and titrate with Mayer's solution.	Concentrate, agitate with acidulated water; separate the water solution from the benzol by decantation or filtering through a wet filter (the benzol will remain in the filter), concentrate, make slightly alkaline (ammonia), and shake with several portions of petroleum naphtha.	
	ALKALINE SOLUTION. <i>Narcotine</i> . Make slightly acid and titrate with Mayer's solution.	PETROL. NAPH. SOLUTION. <i>Emetine</i> . Agitate with acidulated water; separate, and titrate its acidulated water solution with Mayer's solution.

Improved Formula for the Preparation of Syrup of Violets.
C. Bernbeck. (*Pharmaceut. Zeitung*, 1879, No. 33.) 100 grams of the fresh flowers, freed from the calyxes, are crushed in a mortar, then gradually impregnated with 50 grams of alcohol, and macerated with the latter in a covered glass jar for from six to eight hours, after which the whole is strongly pressed. The resulting liquid

is made up with water to 100 grams, filtered, and mixed with 900 grams of freshly prepared, thick, simple syrup.

The syrup thus obtained is an excellent product, both as regards colour and odour. The alcohol employed effects a complete separation of albumen and pectic substances, and ensures a complete solution of all the cyanin and violin contained in the flowers.

The amount of alcohol in the syrup does not exceed 3 per cent. by weight, which, considering the small dose, cannot be regarded as objectionable.

Extractum Cannabis Indicæ. W. H. Deprez. (Abstract from an inaugural essay; *Amer. Pharm. Journ.*, Nov., 1878, 518.) The author endeavoured to ascertain the quality of commercial extract of Indian hemp from its behaviour to solvents. The amount of moisture was first determined by exposing 100 grains of the extract to the heat of a water bath until it ceased to lose weight. The residue was next treated with water until deprived of all principles soluble in this menstruum, and the undissolved portion dried and weighed. A portion of the undissolved residue was then successively treated with petroleum benzin, benzol, and alcohol, and in each case the amount of dissolved matter ascertained. A small residue was finally left, which was found to be insoluble in ether, chloroform, olive oil, oil of turpentine, and potassa. The samples examined were: (1) one prepared from gunjah by the process of the U. S. Pharmacopœia; (2) a sample prepared in Germany; (3 and 4) two samples prepared by two different manufacturers in England. Calculated for 100 grains of the original extracts, the results were as follows:—

Soluble in														
Loss by Heat.			Water.	Petroleum Benzin.			Benzol.	Alcohol.	Insoluble.	Total.				
1	.	1.7	.	1.5	.	73.8	.	18.4	.	1.4	.	3.3	.	100.1
2	.	1.2	.	1.7	.	73.8	.	17.5	.	2.3	.	3.5	.	100.0
3	.	10.5	.	3.4	.	65.4	.	16.5	.	1.4	.	2.7	.	99.9
4	.	2.0	.	18.8	.	60.2	.	15.4	.	0.9	.	2.7	.	100.0

Detection of Alcohol in Essential Oils. A. Drechsler. (*Chem. Zeitung*, 1878, 270.) The reagent employed by the author is a solution of 1 part of potassium bichromate in 10 parts of nitric acid of 1.30 sp. gr. Five or six drops of the oil to be tested are mixed in a small flat porcelain dish with two or three drops of the reagent, and allowed to stand for some time. In the presence of alcohol, the characteristic pungent odour of ethyl nitrite will be evolved as soon as the two liquids are brought together, while

peculiar changes of colour, varying with different oils, will be observed after some time.

Notes on some of the Diluted Acids of the Pharmacopœia. (*Chem. and Drugg.*, March, 1879, 99.) In criticising the directions of the B. P. for the preparation of the diluted acids, the writer considers it a bit of ultra-refinement to require that the measured acid shall be added to a certain quantity of water, and that, after a certain temperature has been arrived at, more water shall be added to make the whole measure a given quantity, when the very measure-glass used, or the mere act of measuring itself, must almost of necessity entail more serious error than any which can possibly arise from change of temperature in the act of mixing. 10, 20, 50, or even more drops may be added to or taken from an ordinary 4 or 10 ounce measure-glass without enabling us to say that it is absolutely incorrect, and yet this implies, so far as the measuring of the acid is concerned, a variation in strength as great as, or probably greater than, any produced by the condensation or expansion resulting from the mixing of the liquids.

In diluting hydrochloric acid, if the acid be added to the water carefully, little by little, the temperature will not be raised many degrees—not more than 8° F.—and the actual condensation of the liquids will not be more than 1 part in 300. In other words, the temperature is so little elevated that it can scarcely be said to affect the bulk of the liquid at all, whilst the condensation which takes place on the addition of the acid to the water is also infinitesimal, being only in the foregoing proportions of nearly 1 in 300. Practically, therefore, the proportions of the Pharmacopœia of 8 ounces of acid by measure to $18\frac{1}{2}$ ounces of water may be accepted as correct, seeing that the difference involved is less than half a fluid dram.

In the case of nitric acid, on the other hand, the temperature is raised higher than with hydrochloric acid, the thermometer indicating about 10° F. increase, whilst the actual condensation, is 1 part in nearly $71\frac{1}{2}$. The Pharmacopœia proportions of 6 fluid ounces of acid, and water to make 31 fluid ounces, will therefore be deficient by 189 drops, or about 3 fluid drams, if the water is measured as 25 ounces previous to mixing. To bring this out more plainly, the formula might run thus:—Nitric acid, 6 fluid ounces; water, 75 ounces and 3 drams; mix. With the flask, the condensation taking place in the process of mixing, the only allowance which requires to be made is that of expansion from increase of temperature, and this would not amount to more than 20 drops.

It is with sulphuric acid that the most extreme results are ob-

tained. On mixing this acid with the water, the temperature is raised nearly 20° F., and the actual condensation after the thermometer has fallen to the temperature of 60° , amounts to 1 in $45\frac{1}{2}$. The Pharmacopœia allows for this condensation to the extent of half an ounce in the 84 ounces, the proportions ordered to be taken being 7 fluid ounces of the acid to 77 ounces of water. This would make 84 ounces but for the condensation, and the directions are therefore further given to add more water, to measure $83\frac{1}{2}$ fluid ounces at 60° F. The Pharmacopœia proportions, though thus allowing for this half-ounce, are therefore still deficient about $1\frac{1}{4}$ ounce, and the process might consequently be given:—Sulphuric acid, 7 fluid ounces; water, 78 fluid ounces and 6 drams; mix.

As a much simpler and certainly far more accurate mode of preparing the diluted acids, the writer proposes the introduction of definite weights of the strong acids into a 10,000-grain flask, and the gradual addition of water to fill the flask to the mark. For this size flask the proportion by weight of the respective acids would be:—Hydrochloric acid, 3,497 grains; nitric acid, 2,743 grains; and sulphuric acid, 1,543 grains. In these circumstances the expansion resulting from the increase of temperature only requires to be allowed for, although it is of little moment, as even in the case of sulphuric acid it does not amount to more than 1 dram, or 1 part in about 170.

With regard to the diluted nitro-hydrochloric acid, it has frequently been pointed out that it will answer to the test neither of specific gravity or of neutralizing power. These might both be conveniently lowered, but, unfortunately, as ordered to be prepared it contains all the elements of uncertainty, and no standard will ever insure absolute uniformity. In directing the mixed acids to be set aside for twenty-four hours previous to adding the water, it is a question if there is not an unnecessary waste of chlorine gas from a too lengthened contact of the concentrated acids. Twelve hours, under ordinary circumstances, seems sufficient to effect the necessary decomposition of the acids, without unnecessary waste of gas, although doubtless much depends upon temperature, exposure, and other conditions which need not be enumerated. The writer has obtained much more uniform and satisfactory results by heating the concentrated acids, and thus producing speedy decomposition, than by any other method. For this purpose the strong acids are put into a large flask or other suitable vessel, and the heat is cautiously but quickly raised until effervescence takes place and the chlorine gas is copiously given off. The water is then added by degrees with brisk

agitation, so as to absorb the free gas which has collected in the upper part of the flask. In this way, if the least care be taken but little chlorine need be driven off, as the heat, if quickly raised, does not to any extent affect the upper portion of the flask, while the concentrated acids are almost at once decomposed, and the whole process may be speedily concluded with but a minimum of the uncertainty characteristic of the official process.

One suggestion only need be thrown out regarding the diluted phosphoric acid; namely, the recognition of a strong acid by the Pharmacopœia, from which the diluted acid might be prepared, as in the case of the other acids already referred to. The popularity of the different preparations into which phosphoric acid enters has already led to the introduction and general acceptance by chemists of a concentrated acid of specific gravity 1.75, and from this the diluted acid might most advantageously be prepared. The relation of this strong acid to the dilute acid of the Pharmacopœia may shortly be referred to, as it may be useful in some instances, and few of the text-books give any information on the subject.

Phosphoric acid of specific gravity 1.75, unlike the glacial phosphoric acid, is tribasic, and has as nearly as possible six times the saturating power of the official diluted acid. In diluting it to the requisite strength, proceed by either of the plans considered in the other dilute acids, namely, by measuring the acid and adding the water, or by weighing the acid in the pint or 10,000-grain flask, and filling up with water. By the former plan, 2 ounces by measure of the acid and water to make one pint, will give a dilute acid corresponding in every respect to the Pharmacopœial preparation. In adding the concentrated acid to the water, the temperature is not raised to any extent, nor does contraction of bulk in the mixed liquids take place to any degree; so that both may be ignored in calculating results.

Organic Impurities in Liquor Ammonia. C. Donath. (*Archiv der Pharm.* [3], xiv., 176.) Many samples of commercial liquor ammonia are so largely contaminated with tarry and empyreumatic impurities, as to form brownish red mixtures with nitric acid, and pink ones with sulphuric acid. The author has examined samples of which 50 c.c., acidulated with sulphuric acid discharged the colour from 3.8 c.c. of permanganate solution, of which each c.c. corresponded to 0.00449 gram of oxalic acid. Such liquor ammonia is unfit for analytical and for many pharmaceutical purposes. The author regards permanganate as a very suitable test for the organic purity of this preparation.

Kinate of Quinine for Hypodermic Injection. H. Collier. (*Pharm. Journ.*, 3rd series, ix., 104.) Solutions intended for hypodermic use require to be neutral, and of such a strength that a few minims only are needed for injection. The author has prepared a solution of ordinary quinine sulphate containing 1 grain in 10 minims, by heating the quinine and water in a beaker and adding just sufficient diluted sulphuric acid to dissolve the quinine; but the solution was found to be too acid for use. In one case, however, in which this was employed, the patient did remarkably well, and no irritation was produced by the punctures. He made some of the so-called neutral sulphate of quinine, but even after a second crystallization its solution was very acid, and it was not more soluble than 1 in 10. Hydrochlorate of quinine is fairly soluble in warm water, and such a solution has been injected warm, but the result was not satisfactory. Kinate of quinine being much more soluble, the author prepared some of this salt by mixing solutions of kinate of barium and sulphate of quinine, and separating the precipitated sulphate of barium by filtration. On evaporation the filtrate yielded the kinate of quinine in amorphous masses, and the same result was obtained by evaporating in *vacuo* over sulphuric acid. A drop of the same filtrate spread over a glass slide and allowed to evaporate slowly, showed very distinct crystalline tufts under the microscope. The plan adopted by the author is to reduce the solution to dryness over a water bath, and then to powder the residue. The kinate obtained by slow evaporation at ordinary temperatures contains a large quantity of water, some of which it loses at 90° F.; so that to ensure a definite product it is necessary to dry it.

Kinate of quinine is very soluble in water, and its solution is perfectly neutral. The strength of the solution which is used at Guy's Hospital is 1 in 4. So far it has given satisfaction, and as it possesses the two great attributes of solubility and neutrality, the author thinks that this salt will supply a real want.

Essential Oil of Bitter Almonds as a Solvent for Iodine. Dr. E. T. Blackwell. (From the *Medical Times*). On placing together powdered iodine and the oil of bitter almonds, the violet colour of the former is immediately, and with great intensity, imparted to the latter; and if they are allowed to remain in contact for a rather long period—two months or more—they unite in the proportion of 1 of iodine to 3 of the oil. This solution mixes freely with oils, fats, glycerine, alcohol, ethers, and fluid extracts of vegetable matter; and is alone a most eligible concentrated preparation for application to parts where a thin fluid is liable to be swept away,

as in the throat, the nares, vagina, and uterus, and where, at best, only a small amount can be made to adhere. As the physiological rather than the chemical action is desirable in a topical application of iodine, this preparation merits acceptance, because it leaves the tissues soft and in good condition for absorption.

Formula for Iodized Oil of Bitter Almonds.

℞ Powdered Iodine ʒj.
 Oil of Bitter Almonds . . . (by weight) ʒj.
 Mix, and shake occasionally for two months.

This may be combined with many other remedies for external application, to meet many different indications. If the purpose be to induce resolution of swollen glands, soap liniment may be chosen; if to produce counter irritation or blistering, cantharidal collodion or croton oil would be suitable. For general external use, in which an emollient, unstaining, and less concentrated article is desirable, the iodized oil of almonds with glycerine fulfils all the indications, leaving the skin after its application supple and without stain. This is beyond comparison superior to "iodine paint," which corrugates the skin and hinders absorption; or to the greasy ointment.

Formula for Iodized Glycerin.

℞ Iodized Oil of Bitter Almonds ʒj.
 Glycerin (by weight) ʒviij.
 M.

This is a most elegant form for external use, and may, properly diluted, be administered internally, in doses of 2 minims = about $\frac{1}{16}$ gr. of iodine and $\frac{1}{8}$ gr. oil of bitter almonds.

The system is said to be best affected by iodine in minute doses and in exceedingly dilute form, as in the natural mineral waters, all excess of the remedy being carried off by emunctories. To meet this view an iodized water may be made:—

℞ Iodized Glycerin ʒj.
 Water ʒj.
 M.

A tablespoonful, containing about $\frac{1}{16}$ gr. of iodine and $\frac{1}{8}$ gr. of oil of bitter almonds, may be taken, diluted at pleasure, for a dose.

As one of the most useful applications of the iodine solution in oil of bitter almonds, the author suggests its addition to cod liver

oil, with the object of increasing the otherwise inappreciably small quantity of iodine contained in the latter. The following is the form he recommends for this purpose:—

℞	Iodized Oil of Bitter Almonds . . .	gr. xvj.
	Cod Liver Oil	℥j.
Mix and shake.		

A teaspoonful, containing $\frac{1}{32}$ gr. of iodine, and $\frac{1}{10}$ gr. oil of bitter almonds, may be taken for a dose.

If 30 grains of the iodized oil of bitter almonds, 2 drams of phosphorated cod liver oil (U. S. D., p. 629), and 1 grain of bromine, be used to the pint of cod liver oil, the ingredients and proportions of Fougerea will be had, *plus* 24 grains of oil of bitter almonds.

Extractum Conii. MM. Rochefontaine and Mourrut. (*Répertoire de Pharm*, 1879, 14.) An experimental comparison of samples of this extract, prepared by different processes, leads the authors to the conclusion that the most active extract is that prepared from the seeds by exhausting with cold alcohol of 90 per cent., distilling off the spirit at a very moderate heat, dissolving the residue in cold water, filtering, and evaporating at a low temperature. The least active extract was that prepared from the entire dried plant.

Practical Hints on the Preservation of Essential Oils. J. B. Moore. (*Druggists' Circular and Chemists' Gazette*, August, 1878.) To have good essential oils, the pharmacist must, in the first place, be scrupulously particular in their selection, purchase only those that are of the finest quality, and as fresh as they can be obtained. What is not needed for immediate use should be transferred to small bottles, which should be filled so full that the cork will touch the oil. The cork should be tied down to prevent its expulsion or working out, and then sealed, or, what is preferable, dipped into a melted mixture (not too hot) of two parts of paraffine and one part of yellow wax, or into melted paraffine alone. The corks employed for this purpose should be carefully selected, sound, and accurately adjusted to the neck of the bottle. The oil should then be immediately placed in a dark, cool place in the cellar.

Any essential oil, although carefully bottled and excluded from the light, will spoil much sooner when kept up in the storeroom than it will in a dark, cool cellar. Many wholesale dealers observe the commendable practice of bottling their essential oils as soon as they are removed from the original packages, but they afterwards keep them up in their warm storerooms, instead of immediately

placing them in a dark, cool place. Consequently their oils must suffer very much from such exposure, although every other precaution for their preservation may have been observed.

It is of the greatest importance, too, that the oil should be bottled immediately after the original package containing it has been opened, and not after the oil has been exposed to the air for several days, or perhaps weeks; for such oils as orange, lemon, juniper, etc., are very prone to change and lose their freshness and delicacy of flavour upon the slightest exposure, and especially in hot weather or in a warm situation. Oxidation commences at once, and, when once begun, progresses very rapidly. The characteristic rich yellow colour of the oils of lemon and orange also begins to change the moment oxidation commences; and after a short exposure to light and air, the altered condition of the oil may be readily detected by the practised eye in the change of colour as well as by the flavour and aroma. Therefore the author recommends that under all circumstances essential oils which are not required for immediate use should be sealed up, as above directed, in bottles holding such quantities as will be most convenient for use, and kept in a cool, dark place. When a bottle is opened and only a portion of the oil is needed, what remains should be immediately transferred to a smaller bottle filled to the cork. But the practice of keeping essential oils, and especially those most prone to change, in a warm store-room, as is too often done, is a most reprehensible practice which cannot be too strongly condemned, as the influence of a warm temperature on these oils in conducing to change cannot be overestimated. There are, of course, some that are not so sensitive as others to this action, but those that are should claim our most faithful protection.

The lack of the proper care on the part of dealers in the preservation of essential oils, together with the adulteration that is often practised by manufacturers and dealers, renders it oft-times next to an impossibility almost to obtain certain of these oils of really unexceptionable quality.

Some essential oils may, even after they have passed into the incipient stage of degeneration, and their natural aroma and flavour have, to a considerable extent, departed, yet retain sufficient of their characteristic and familiar odour to deceive the inexperienced or indifferent purchaser. According to the author's observation, a large proportion of the oils of this class as found in the general market are precisely in this condition.

Retail pharmacutists and perfumers may preserve many essential

oils unimpaired for a long period by mixing them while fresh with an equal bulk of alcohol, filling the bottles full, corking tightly, and placing the mixture in a cool, dark place. The oil of orange, one of the most difficult to preserve, has been kept in this way for a long time without the slightest perceptible change, notwithstanding the bottles were frequently opened and parts of the oil taken out. But for many purposes the admixture of the alcohol would be objectionable.

The Alleged Antagonistic Action of Atropine and Morphine. Dr. Knapstem. (*Berlin Klin. Wochenschr.*, No. 47. From *Pharmaceut. Centralhalle*.) The author reports a series of experiments undertaken to test the power alleged to be possessed by morphine and atropine to mutually neutralize the effects the one of the other. These experiments show that a simultaneous administration of morphine with atropine, or *vice versa*, did not allow larger doses of either poison to be administered to dogs than they could support if given singly. It is possible that in cases where such immunity would seem to have been observed, comparatively inert atropine may have been employed.

Fluid Extract of Wild Cherry. W. O. Higate. (*American Journal of Pharmacy*, March, 1879, 121.) A fluid extract of wild cherry bark, prepared by the process described below, is regarded by the author as possessing all the virtues of the drug, and as containing the active ingredients of a troy ounce in a fluid ounce of the preparation:—

18 troy ounces of the bark are reduced to a powder, passing through a No. 40 sieve. Of this powder 16 troy ounces are well moistened with a mixture consisting of 4 parts of glycerin, 4 parts of simple syrup, and 2 parts of water. The moistened powder is then packed moderately tight into a cylindrical glass percolator, and a sufficient quantity of the mixture is poured on until the liquid just begins to drop. The percolation is then corked and covered and set aside for four days, during which time the amygdalin will be decomposed into volatile oil and hydrocyanic acid. Percolation is then commenced with the mixture mentioned above, to 10 parts of which 1 part of alcohol has been added. The first 14 fluid ounces are to be reserved, and the percolation continued until 6 fluid ounces more have been obtained, the latter portion being employed for percolating through the reserved 2 troy ounces of the bark, after they had been moistened with a portion of the original menstruum for three or four days. From this second portion of the bark 2 fluid ounces of liquid are obtained, and this is mixed with the reserved 14 fluid ounces.

Fluid extract of wild cherry bark thus prepared keeps well, has the proper odour and taste of the bark, and possesses the advantage of mixing in all proportions with water without causing precipitation.

Linimentum Terebinthinæ Aceticum. W. Symons. (*Pharm. Journ.*, 3rd series, ix., 505.) At the Bristol meeting of the British Pharmaceutical Conference, in 1875, the author suggested the two following formulæ as an improvement upon that of the British Pharmacopœia:—

No. 1.

Glacial Acetic Acid	. . . .	1 part.
Spirit of Camphor	. . . .	2 „
Castor Oil	. . . .	1 „
Turpentine	. . . .	2 „

Mixed in the above order.

No. 2.

Liniment of Camphor	. . . .	2 parts.
Castor Oil	. . . .	2 „
Turpentine	. . . .	2 „
Glacial Acetic Acid	. . . .	1 „

He now reports castor oil to be unnecessary, as a clear and stable liniment may be made as follows:—

Turpentine	. . . .	3 parts.
Liniment of Camphor	. . . .	3 „
Glacial Acetic Acid	. . . .	1 „

This may be said to be identical with the Pharmacopœia liniment, minus 2 parts of water; for as, according to the Pharmacopœia, glacial acetic acid contains 84 per cent. of anhydrous acetic acid, while the B. P. acetic acid contains 28 per cent., it is assumed to be near enough to the truth for the purpose of this paper to speak of B. P. acetic acid as containing 1 part glacial acid and 2 parts water. The Pharmacopœia liniment will thus contain 1 part in 9 of glacial acid, while No. 3 will contain 1 part in 7, although the proportion of glacial acid to the turpentine and camphor will be identical in each.

Should it be thought desirable to have in the liniment exactly the same proportion of acetic acid as in the Pharmacopœia, *i.e.*, in relation to the whole quantity of liniment, the formula would be:—

Turpentine	. . . .	4 parts.
Liniment of Camphor	. . . .	4 „
Glacial Acetic Acid	. . . .	1 „

Should spirit be considered a desirable ingredient of the liniment, of course No. 1 may be adopted; but it will be perceived that the proportion of glacial acid in this formula is 1 in 6. If this be thought too much, the following may be a satisfactory formula:—

Glacial Acetic Acid	. . . . .	1 part.
Spirit of Camphor	. . . . .	3 „
Castor Oil	. . . . .	2 „
Turpentine	. . . . .	2 „

Of course it is a medical rather than a pharmaceutical question, as to which of the above formulæ may be the best; but as it has been stated that it is not desirable to increase the proportion of acetic acid, the author thinks that No. 4 is the preferable one.

It may be well to say that the above liniments were made with a sample of glacial acid which crystallized at 52° , and did not completely liquefy in a day in a temperature of 58° to 62° , so that it was stronger than the Pharmacopœia acid, the latter “crystallizing when cooled to 34° , and remaining crystalline until the temperature rises to above 48° .” On mixing only 5 per cent. of acetic acid, B. P., with the above acid, none of the above formulæ give satisfactory results.

Probably it may be said that no simpler or more quickly applied test of the strength of glacial acetic acid has hitherto been suggested than the making of this liniment. With regard to the point of crystallization, and as an illustration of the apparent anomalies so fully discussed by Mr. Tomlinson in his paper on “Supersaturation,” the author has had the same glacial acetic acid in a similar bottle, exposed during a night to a temperature of 49° without crystallizing; but on dropping in a crystal, it was at once converted into a solid mass.

Referring to the foregoing, a correspondent of the *Pharmaceutical Journal*, signing himself P. B., thinks that Mr. Symons seems to have overlooked the activity of the turpentine and camphor liniment. He suggests the following formula as more nearly representing the official preparation:—

Glacial Acetic Acid	. . . . .	1 ounce.
Camphor Liniment	. . . . .	3 „
Turpentine	. . . . .	3 „
Olive Oil (to make)	. . . . .	9 „

If the excess of olive oil is objectionable, spirit may be substituted under the conditions Mr. Symons pointed out in his earlier paper on this subject.

Linimentum Terebinthinæ Aceticum. H. Collier. (*Pharm. Journ.*, 3rd series, ix., 1033.) The author suggests the use of a tincture prepared from the bark of *Quillaia saponaria* as an emulsifying agent in the preparation of this liniment. The following formula gives a creamy emulsion, which is permanent for at least six minutes after shaking, and which slowly separates into three layers—a watery one below, a cream in the centre, and an oily stratum at the top. After the lapse of several hours this resolves itself into two layers.

℞ Ol. Terebinth.,
 Acid. Acetic.,
 Lin. Camph.,
 Tinct. Quillaie . . . āā partes æquales.

Shake together the tincture, camphor liniment, and oil of turpentine, and then add the acetic acid and again shake.

Tinctura Ferri Acetates Rademacheri. A. Thanisch. (*Pharmaceut. Zeitung*, 1879, 15.) The author points out that the percentage of ferric oxide in this tincture is given too high in the Prussian Addendum, which requires 100 parts by weight to yield 6 parts of the oxide. If all the iron used were present in the tincture as ferric acetate, 100 parts of the tincture could only contain 2.5 parts of ferric oxide; but in practice the percentage of the latter is rarely found to exceed 1.5 per cent. A not inconsiderable portion of the iron separates from the tincture on standing, in the form of ferric oxyacetate, which coats the sides of the bottle.

Adulterations of Essential Oils. M. Leonhardi. (*Archiv der Pharm.*, ccxii., 490. From *Amer. Journ. of Pharm.*) The author considers the usual test for adulteration with alcohol, which consists in mixing the suspected oil in a graduated tube with water, and then observing the increase or decrease in bulk of the latter, reliable, but objectionable and unadvisable for expensive oils, on account of the unavoidable waste of the latter. He prefers the anilin test, which is applied by dropping a little of the suspected oil on a crystal of anilin red, when the presence of alcohol is immediately indicated by a red coloration. The following adulterations were noticed by the author, who found the tests mentioned in connection with them reliable.

Fennel oil stearopten is imported from Russia for adulterating oil of anise, often to the extent of 90 per cent., because it likewise solidifies at a low temperature; it develops, however, a very

characteristic odour of fennel when heated, which easily betrays the adulteration.

Oil of coriander is extensively adulterated with colourless rectified oil of orange, which can be detected by its insolubility in 90 per cent. alcohol, in which pure coriander oil dissolves in every proportion. Equal parts of oil of orange and 90 per cent. alcohol makes a turbid mixture.

Oil of bergamot is adulterated with oil of orange. The insolubility of oil of orange, and the solubility of oil of bergamot in 90 per cent. alcohol, also furnish a method of detection in this case.

Oil of caraway is often mixed with oil of caraway-chaff, which again is adulterated with oil of turpentine. Pure oil of caraway dissolves in 90 per cent. alcohol, while it forms a cloudy mixture if adulterated with turpentine. The behaviour to iodine and the odour are often sufficient to prove the adulteration.

An American oil of peppermint, which had obtained about half a dozen world exhibition prize medals, and is sold in blue bottles holding 750 grams, was tested by the author. Iodine produced no red vapours, and anilin red no coloration; oil of turpentine and alcohol were therefore absent; 90 per cent. alcohol made a cloudy solution, while genuine English oil dissolves clear in every proportion. When mixed with equal parts of H_2SO_4 , a dark red coloration was produced, which remained on the addition of alcohol, while English oil causes a brown coloration. After comparing the American oil with different samples of European oils, the author came to the conclusion that the former was adulterated with rectified oil of sassafras.

An Improved Formula for Liquid Extract of Yellow Cinchona. M. Conroy. (From a paper read before the Liverpool Chemists' Association, and recorded in the *Pharm. Journ.*, 3rd series, ix., 514.) The author's experiments clearly prove that proof spirit is the best menstruum for exhausting this bark, and thus lead to the same conclusion on this point as those communicated to the British Pharmaceutical Conference, at its Dublin meeting, by Mr. Ekin. He recommends the following formula, as yielding a thoroughly satisfactory product, one ounce of which is equal in strength to one ounce of the bark :—

Yellow Cinchona in fine powder	. . . . .	205
Proof Spirit	. . . . .	a sufficient quantity.

Moisten the powder with 10 fluid ounces of the spirit, and pack gently in a percolator; pour on to this another 10 fluid ounces of

the spirit, so as to thoroughly saturate the powder. Allow this to macerate for a couple of days, and then start the percolation, occasionally adding fresh menstruum until 16 fluid ounces have been collected. Reserve this portion, and continue the percolation until two more pints of percolate have been obtained. Evaporate this at a temperature not exceeding 180° F., to the consistence of a soft extract, which re-dissolve in sufficient proof spirit to make up 4 fluid ounces; add it to the reserved portion, and filter if necessary.

The 2 pints of percolate are ordered to be reduced to an extract on account of the greater volatility of the alcohol of the menstruum, which in passing off before the watery portion leaves a rather unsightly watery mixture behind, and this, if reduced to 4 fluid ounces and added to the reserved portion, would so reduce its alcoholic strength as to cause a deposit of some of its active properties. The evaporation necessary in this process is certainly a disadvantage, but if carefully and expeditiously conducted, at the above-named temperature, this defect may be reduced to a minimum. After collecting the first 16 fluid ounces, it is a good plan to work the remainder of the menstruum in three or four separate portions, passing each twice through the percolator, by which means less menstruum may be made to answer. The spirit can be recovered from the 2 pints of percolate, and also from the marc, by distillation.

Solubility of Chloral Hydrate in Fats. M. Catellon. (*Répertoire de Pharm.*, 1878, 272.) The author makes use of the solubility of chloral hydrate in fats in recommending the following preparations for its external administration.

Linimentum Chloral Hydratis.

Chloral Hydrate	.	.	.	.	.	6 grams.
Oil of Almonds	.	.	.	.	.	30 "

Dissolve in a stoppered bottle by immersion in hot water, removing the stopper occasionally to allow the expanded air to escape.

Unguentum Chloral Hydratis.

Chloral Hydrate	.	.	.	.	.	6 grams.
Lard	.	.	.	.	.	27 "
White Wax	.	.	.	.	.	3 "

Melt the wax and lard, and dissolve the chloral in the mixture in a wide-mouth bottle kept immersed in hot water. The wax may be left out in cold weather.

In a similar manner chloral hydrate may be incorporated in suppositories.

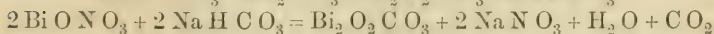
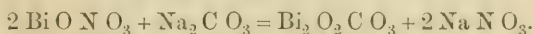
The Incompatibility of Subnitrate of Bismuth with the Alkaline Bicarbonates. T. Green. (*Pharm. Journ.*, 3rd series, ix., 505.) The following experiments were made with the object of arriving at a clear understanding of the nature of the changes to which the well-known incompatibility of the above-named substances is due:—

2 drams of bismuth subnitrate, and the same of sodium bicarbonate, were mixed with a small quantity of distilled water, and the bottle containing them was corked and set aside. In a short time, perhaps ten minutes, effervescence commenced, and in about an hour the cork was expelled from the bottle. The cork was replaced, and the reaction allowed to go on until all effervescence had ceased. The mixture was then transferred to a small filter, and the filtrate tested for H N O_3 , which was found. The precipitate after being very well washed, was also examined for H N O_3 , but without success. It, however, effervesced briskly on the addition of dilute sulphuric acid, proving the presence of C O_2 . Examined by a lens, the precipitate had lost the crystalline structure of the subnitrate, corresponding now in appearance with the carbonate. This experiment was repeated, substituting sodium carbonate for the bicarbonate, with the following result: no effervescence whatever took place, but at the end of forty-eight hours the bismuth was examined and found to be entirely converted into the carbonate.

The bismuth subnitrate used was perfectly neutral in its action on litmus paper.

It would thus appear that, independently of any free acid which may be present in subnitrate of bismuth owing to insufficient washing, (1) an admixture of this bismuth salt with the alkaline carbonates or bicarbonates results in mutual decomposition; (2) that when the carbonates are used, decomposition without effervescence ensues; and (3) that when the bicarbonates are used, decomposition with liberation of C O_2 takes place.

The following equations will render these propositions intelligible:—



In dispensing such mixtures, it is clearly the duty of the compounder to complete as far as possible the decomposition before sending out the mixture. This may be partially effected by rubbing the two salts in a mortar with a little hot distilled water until the

liquid is cold. But whenever practicable, the attention of the prescriber should be drawn to the incompatibility, and the substitution of bismuth carbonate in the place of subnitrate suggested.

Recovering Ether in preparing Ethereal Extracts. E. Rohn. (*Schweiz. Wochenschr.*, December 8, 1878.) Instead of recovering the ether by expressing the exhausted drug, the author mixes the drug with sufficient water to form a thin paste, and then heats the latter in a still over an open fire to about 60° C., when the ether evaporates and passes into the condenser. In this manner the author recovered more than 3 kilos of ether from 8 or 10 kilos of extract of male fern.

Valuation of Blistering Beetles. L. Fahnestock. (Abstract from an inaugural essay. *Amer. Journ. of Pharm.*, June, 1879.) In undertaking a series of experiments on this subject, old Chinese blistering beetles were first treated by the process of Professor Procter, as modified by Fumouze. 200 grains of powdered *Mylabris cichorii* were exhausted with chloroform by maceration and expression; from the solution thus obtained most of the chloroform was distilled off, the residue was poured into a dish, and the retort rinsed out with a small quantity of chloroform, and this added to the balance. This solution was allowed to evaporate spontaneously to the consistency of a thick extract, which was treated with bisulphide of carbon; a large quantity of fatty matter was taken up by the solvent, but a considerable quantity of foreign matter was left behind with the cantharidin. This impure cantharidin was then dissolved in a small portion of alcohol, the solution passed through a filter in order to remove a little dust, and allowed to evaporate spontaneously; the cantharidin was obtained in slightly purer crystals, but still of a dark brown colour, and weighed 2·8 grains.

This strange insolubility of a portion of the fatty matter in bisulphide of carbon is entirely at variance with the experiments of Professor Maisch, conducted by the same process and on the same lot of beetles about six years ago, at which time he obtained the cantharidin almost white without purification. It was concluded, therefore, that the solubility of the fatty matter had become impaired by the age of the beetles, as no particular precaution had been taken to preserve them. 200 grains of the powder were now exhausted with acetic ether by displacement, about 6 fluid ounces of percolate being obtained. The greater part of the acetic ether was distilled off, and the balance allowed to evaporate spontaneously. The residue was treated with bisulphide of carbon, which dissolved a portion of the fatty matter, but a considerable quantity remained undissolved,

as in the former case. The residue was dissolved in hot alcohol, from which on cooling 1·3 grains of much purer cantharidin crystallized, while that remaining in the alcohol could not be freed by simple solvents from the contaminating foreign matter.

200 grains of the powder were, according to Dragendorff's process, digested in hydrate of potassium for about fifteen minutes, the mixture treated with hydrochloric acid in excess, dried and treated by displacement with petroleum benzine, with the view of removing, if possible, the fatty matter beforehand. A dark-coloured solution was obtained, from a portion of which the benzine was evaporated off, leaving the oil of a dark brown colour and of a butyraceous consistence. This was tested for cantharidin by applying a small quantity to the arm, but no effect was produced, proving the insolubility of cantharidin in petroleum benzine. The powder was then exhausted with chloroform and treated in the same manner as in the first experiment. The cantharidin obtained by this process was of a much purer form, crystalline, and of a light yellow colour, and weighed 2·5 grains.

The yield and purity of the product being most satisfactory by this last process, it was adopted in the following experiments:—

Cantharis vittata, the potato bug, was next examined, 150 grains of the powder being used, yielding two grains of almost pure cantharidin in rather large crystals, which when obtained, along with the fatty matter, were long and needle-shaped, but after purification assumed a square and tabular form. This leads to the conclusion that the presence of the fatty matter changed the shape of the crystals.

Three specimens, 200 grains each, of *Cantharis vesicatoria* were next examined. The first was a sample of the fresh, two of old beetles, one consisting of the soft, the other of the hard parts of worm-eaten cantharides, the portions being separated by a sieve of ten meshes to the inch. The result was less successful, as a considerable amount of fatty matter could not be removed by the petroleum benzine, but remained intimately associated with the cantharidin, being insoluble in bisulphide of carbon and other solvents, except those which also dissolved the cantharidin. Filtering through animal charcoal also failed to separate it. In fact, the presence of cantharidin was at first doubted altogether, as there was no appearance of crystallization. It was, however, tested by applying a small quantity to the arm, and although vesication was produced, it took a much longer time to produce the effect. It was evidently very impure.

The portion obtained from the soft parts of the worm-eaten variety, weighed 5.9 grains, and that from the hard parts of same sample, 2.9 grains. The fresh cantharides did not yield crystallized cantharidin, either by this or by Procter's process; and it was, therefore, concluded that the insects were really old, notwithstanding their fresh and undamaged appearance.

In summing up the results, the following points are presented:—

1. Old *Mylabris cichorii* yield 1.25 per cent., and fresh *Cantharis vittata* 1.3 per cent. of cantharidin.

2. By age the virtues of the beetles are impaired, and less effectual for vesication, and a portion of what appears to be fatty matter becomes insoluble in bisulphide of carbon, petroleum benzin, etc., rendering the isolation of cantharidin much more difficult.

3. By the treatment with hydrate of potassium and hydrochloric acid, the yield of cantharidin is increased, probably from the decomposition of ammonium and magnesium compounds of cantharidin contained in the beetles.

4. By exhaustion with petroleum benzine, a large quantity of the fatty matter, but no cantharidin, is removed, thus facilitating the subsequent operations.

Note on Plasma. W. Willmott. (From a paper read before the Pharmaceutical Society, April 2, 1879, and printed in the *Pharm. Journ.*, April 5, 815.) Although the value of glycerin of starch as a substitute for fatty substances in ointments, etc., has long been established, this preparation has never been largely employed in that capacity, probably owing, in some measure at least, to its tendency to soften by deliquescence. The author therefore discusses the question whether this tendency may not be overcome or counteracted by the previous introduction of a suitable proportion of water into the preparation. He finds that, in whatever proportionate quantity water may be added to glycerin, from a single drop upwards, absorption will take place in a moisture-laden atmosphere, until the proportion reaches three parts by measure of the former to one of the latter. At this point the glycerin, so to speak, gives up the contest, and succumbs to the influence which the water exerts in the opposite direction. In this mixture, therefore, there will be neither attraction nor evaporation, the weight scarcely varying from week to week, either in one direction or the other. If, however, the experiments be conducted in a dry atmosphere, as in that of an ordinary working or sitting-room in which a fire is kept burning during the day, the action will be the same, but to obtain similar results the proportions will be widely different,

and in fact, almost reversed. Instead of three parts of water to one of glycerin, nearly three parts of glycerin to one of water will be required to reach the neutral point. Where, in the one case, there is absorption and augmentation, in the other there is evaporation and consequent loss; so that in order to maintain a uniform condition in the mixed liquids, the proportions must be adapted to the exact state of the atmosphere in which they are intended to be kept. In a general way it may be assumed that two and a half parts by measure of glycerin to one of water are well adapted to meet the end in view. Bearing in mind, then, that in plasma the starch has no effect in preventing the absorption of moisture (the mass being by such means gradually undermined and softened through), advantage may be taken, in preparing this substance, of the peculiarity alluded to, and the process worked as follows:—5 fluid ounces of glycerin are mixed with 3 fluid ounces of distilled water in a porcelain dish; or, preferably, transferred thereto from a vessel in which they have been previously well stirred or shaken together. The starch is then added *secundum artem*, and heat gradually applied with constant stirring, until a translucent jelly is formed. In this process, the loss of weight by evaporation will be from half to one ounce, according to manipulation, thus leaving the desired proportions of glycerin and water in the resulting product. In this way a plasma is obtained that will resist the action of moisture, and retain indefinitely its firm and plastic condition. The presence of water, so far from being objectionable, will be a decided advantage, since in application there will be less proneness to smarting and irritation.

Vinum Cinchonæ. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1879, No. 14.) The author points out that the preparation of cinchona wine according to the usual formulæ involves a great waste of bark, inasmuch as not more than one-half of the alkaloids contained in the bark are actually dissolved, and about one-half of the dissolved alkaloids separates out again on keeping; so that the wine, after being kept for some time, does not contain more than one-fourth of the alkaloids present in the quantity of bark used. He therefore proposes to exhaust the bark with white wine to which 1-1½ per cent. of hydrochloric acid has been added. Such a preparation would contain the whole of the active principles of the bark, and retain them completely even after prolonged keeping.

Assay of Cinchona Barks. M. Prunier. (*Journ. de Pharm. et de Chim.*, xxix., 135.) An intimate mixture of 10 grams slaked lime, 30 grams of water, and 20 grams of the powdered bark is dried on

a water bath, and then exhausted with chloroform containing one-fourth of its weight of alcohol of 95 per cent. The solution is evaporated to dryness, the residue treated with dilute hydrochloric acid (containing 10 per cent. of H Cl), the resulting solution filtered and precipitated with ammonium hydrate. The precipitated alkaloids are collected on a filter, washed with water containing a little ammonia, dried, and weighed. From the total alkaloids thus obtained, the quinine is extracted by pure ether; or the hydrochloric acid solution of the precipitated alkaloids may be treated with sodium bicarbonate in the presence of tartaric acid (as recommended by Oppermann), when the quinine will be left in solution.

Thymol and Thymol Camphor. C. Symes. (*Pharm. Journ.*, 3rd series, ix., 598.) If thymol, chloral hydrate, and camphor are rubbed together in a mortar, the whole at once liquefies and produces a combination possessing powerful antiseptic properties. Further experiments showed that thymol and camphor, when rubbed together in the absence of chloral hydrate, also become liquid, and that the proportions could be varied from two parts thymol and one of camphor, to one part of the former, and ten of the latter, the result being a colourless syrupy liquid; equal parts of each give very satisfactory results.

The solubility of thymol in water is not greatly increased by this combination, but it is a very convenient form from which to prepare the ointment.

Thymol camphor can be mixed with vaseline, unguentum petrolei, or ozokerine, in almost any proportion.

An ointment prepared with 20 per cent., equal to 10 per cent. thymol, has been kept for some weeks without any separation whatever.

A saturated solution of thymol in water (1 in 1000) is found to be sufficiently strong for the spray during surgical operations; but for the throat and various other purposes it is often required stronger, and in such cases the author finds no solvent better than milk, which takes it up readily in almost any proportion up to nearly 10 per cent. of its weight. But it will rarely be required of such strength. Solution of borax is not a good solvent, but glacial acetic acid dissolves it most readily; a large proportion, however, separates on dilution. The *acidum aceticum* of the Pharmacopœia dissolves 2 grains in the fluid ounce. There appears to be some difference in the sp. gr. of thymol, arising probably from the source from whence derived; that described by Mr. Gerrard, had a sp. gr. of 1.028, and hence was heavier than water; whilst the specimens the

author has met with have only a sp. gr. of 0.980 to 0.990, and float on or near the surface.

Note on the Estimation of Quinine in Ferri et Quinæ Citras. W. Stevenson. (*Pharm. Journ.*, 3rd series, ix., 673.) The official process is somewhat inaccurate, owing to a loss of quinine in the washing of the precipitate. To avoid this, the author suggests the following modification, which he has found to give very accurate results:—

Dissolve 5 grams of the citrate in 50 c.c. of water, add a slight excess of dilute solution of ammonia (.960), stir well, and after standing five minutes pour on to a double filter, made of two filter papers of open texture, tared on a balance, one against the other, by cutting down the heavier; the smaller one to be placed outside to prevent the precipitate getting between the two. This dispenses with weighing and drying a filter, as both have the same solutions passing through them, and remain equal in weight.

Instead of distilled water, the following solution is to be used for washing:—1 ounce of ammonia (.880) is added to 80 ounces of distilled water. The precipitated and washed quinine from 1 dram of the sulphate is added to the dilute ammoniacal solution, and well shaken during twenty-four hours. As much as may be required is then filtered and used in an ordinary wash-bottle.

The precipitated quinine may now be freely washed with this solution; no quinine will be lost, and if the precipitation has been properly performed, every trace of iron may be removed in from five to ten minutes, leaving the alkaloid white and granular. In this short time, any quinine deposited by evaporation of the washing solution would be so small that it may be neglected. Remove the filter from the funnel, and thoroughly drain on bibulous paper for two or three hours. If the drying be commenced without this precaution, the water held by the precipitate will, on becoming hot, dissolve a portion of it. Dry at a temperature not exceeding 100° F. until constant in weight, the outside filter acting as a counterpoise.

The foregoing process is an adaptation of Teschenmacher's method of estimating morphine in opium. (See *Year-Book of Pharmacy*, 1877, p. 130.)

Determination of the Specific Gravities of Solid Fats, Resins, etc. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1879, No. 13.) The author melts about 5 grams of the fat or resin on a water bath, and drops it from a height of two to three c.m. into a flat-bottomed dish containing a column of about 2 c.m. of cold alcohol of 60 to

90 per cent. He then removes the solidified drops with a teaspoon, and places them into a mixture of alcohol and water, or of glycerin and water, the choice of the mixture depending on the body under examination being lighter or heavier than water. After this he varies the composition of the mixture by adding more of the lighter or of the heavier liquid until the fat globules float, cease to rise to the surface or to sink to the bottom, but float in the mixture, and this point being attained, he determines the specific gravity of the mixture freed from the fat. The specific gravity of the fat or resin is, of course, equal to that of the mixture in which it floated.

In diluting the alcohol or glycerin used for the preparation of the mixtures, it is best not to use water, but mixtures of water and a little spirit, or of water and a little glycerin, and to shake in such a manner as to prevent, as much as possible, the formation of air bubbles.

The determination of the specific gravities of fats, resins, paraffins, etc., thus becomes a simple and easy operation, and afford in many instances the readiest means of showing the presence or absence of adulteration.

Succus Carnis. J. Martinson. (*Pharmaceut. Zeitschr. für Russland*, 1879, No. 13.) The author reports on a preparation now extensively prepared and used in St. Petersburg under the name of *succus carnis*, which he regards as superior to Liebig's beef-tea, and to the various pancreatic and other meat preparations hitherto introduced. It is simply prepared from fresh perfectly lean beef by hydraulic pressure, and is consumed on the day it is made, as it does not keep well for more than twenty-four hours. It is a clear red liquid, in which the microscope shows a few blood cells and fat globules. Its specific gravity is 1·031–1·037. Flavoured with a little salt, it has a pleasant taste, and is relished and readily digested even by very young children. It contains in 100 c.c.—

Organic Matter	6·12 grams.
Mineral Matter	1·04 „
Water	92·84 „

The 6·12 grams of organic matter are composed of—

Albumen	3·86 per cent.
Sugar	0·30 „
Gelatin, Creatin, Isatin, etc.	1·96 „

The 1·04 gram of mineral matter was found to contain 0·064 gram of phosphoric acid, in the form of acid phosphates of potassium and calcium.

The "meat juice" recently imported in large quantities from America is in no sense to be compared with this preparation. It does not contain more than 0.1 per cent. of albumen, as at the temperature at which it is made (52° to 54° C.) the latter is almost completely coagulated.

The Testing of Peruvian Balsam. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1879, No. 31.) The author recommends the following tests for the purity of the balsam:—

1. Dropped from a height of 18 to 20 c.m. into a solution of 25 parts of common salt in 115 parts of water, the balsam should sink.

2. When shaken with 3 to 4 volumes of petroleum ether, the latter, after decanting from the balsam, should be perfectly clear and colourless.

3. A solution of 1 part of the balsam in 7 parts of rectified spirit should have a dark brown colour, and should form a milky mixture with 3 parts of water, remaining milky for fully two days.

4. The test with strong sulphuric acid, as recommended in the German Pharmacopœia, should be performed with 3 parts of the balsam and 4 parts of the acid, instead of using the two in equal proportion, as recommended by that authority.

5. 5 grams of the balsam when boiled with 0.14 gram of anhydrous sodium carbonate and 10 grams of water, should yield a neutral or slightly acid, but not an alkaline mixture.

The Solution of Iodine in Iodide of Potassium. A. Guyard. (*Bull. de la Soc. Chim.*, xxxi., 297.) The author regards a solution of iodine in an aqueous solution of potassium iodide, as containing the iodine in the form of a compound of the formula KI_3 , and not in the free state. Such a solution produces with lead nitrate or acetate a black precipitate, which can be strongly heated without parting with iodine, and therefore contains none of the latter in the free state. The formula of this precipitate is PbI_4 . With mercuric nitrate it forms a scarlet precipitate of HgI_2 ; while with mercuric chloride it forms a black precipitate, which when heated to 100° C. parts with iodine and leaves mercuric iodide. Silver nitrate produces a precipitate consisting of silver iodide and free iodine. With pure methyl-alcohol, rendered slightly alkaline, the solution of potassium biniodide gives a copious precipitate of iodoform; which it fails to do with ethyl alcohol. It may, therefore, be used for distinguishing these two alcohols.

NOTES AND FORMULÆ.

PART IV.

NOTES AND FORMULÆ.

Salicylic Acid as an Anthelmintic. M. Marynowsky. (*Apoth. Zeitung*, 1879, 6.) The author succeeded in expelling a tapeworm in a case in which all the usual remedies had been repeatedly tried and failed. Four doses of 8 grains each were administered at intervals of one hour, the last dose being followed by a tablespoonful of castor oil. The expulsion of the worm occurred without pain or unpleasant symptoms of any kind.

Tasteless Castor-Oil Mixture. Dr. W. V. Ezell. (*New Remedies*, Sept., 1878, 285.) The author furnishes the *Louisville Medical News* with a receipt for a castor-oil mixture which he claims to be so palatable that patients require to be told what it is in order to recognise its nature:—

R	Olei Ricini	3j.
	Tinct. Cardamomi co.	3iv.
	Olei Gaultheriæ	gtt. iv.
	Pulv. Acaciæ,	
	Pulv. Sacchar alb.	āā 3ij.
	Aq. Cinnamomi	q .s. ut ft. 3iv.
	Misce secundum artem.	

Cantharidized Collodion. Prof. Gubler. (*Pharm. Journ.*, 3rd series, ix., 46.) The author recently stated, at the Therapeutical Society, that cantharidized collodion forms the most practically useful of vesicants, all that is necessary being to paint with a brush within the exact limits to which blistering is required to be confined. The collodion dries, and the blister is formed. So complete is the adhesion, that when applied to an indocile child, he is unable to remove the collodion before the vesicating action occurs.

Collodium Iodoformiatum. (*Pharmaceut. Centralh.*, Oct. 3, 1878, 373.)

R	Iodoformii	1·0
	Tritum agitando macerandoque solve in	
	Collodii flexilis	15·0

Moleschott has successfully used this preparation in glandular
s

swellings, swelling of the spleen, orchitis, dropsical affections, and inflammation of the heart, and for subduing pain in goutic swellings.

Medicated Solutions of Alumina. H. G. Debrunner. (*Amer. Journ. Pharm.*, Dec., 1878.) To the class of remedies that once had an almost general reputation, and now, in spite of their therapeutic value, are scarcely used, belongs the benzoinated solution of alumina; the preparation, dose, and mode of application of which will be found in the United States Dispensatory, p. 1011, 13th edition.

Similar to Pagliari's styptic liquid, it surpasses the same in efficiency and purity in many respects, besides being at the same time by no means an expensive article (*vide* U. S. D., p. 174, 13th edition).

Instead of using an alum solution, as done by the before-named Roman pharmacist, a solution of sulphate of alumina, $\text{Al}_2\text{O}_3 \cdot 3\text{S O}_3$, previously saturated with alumina hydrate so as to make its composition approach that expressed by the formula $(\text{Al}_2\text{O}_3)_2 \cdot 3\text{S O}_3$, is heated for several hours with a certain quantity of bruised benzoïn. By this treatment a number of the constituents of benzoïn are dissolved in the solution, among which benzoic acid and a resinous brownish body possessed of aromatic odour are the most important. By this mode of preparation the existence of free non-combined sulphuric acid, which might be found in Pagliari's original solution, is rendered impossible. If properly prepared, the sp. gr. of this compound is 1.26; it is perfectly clear, and of a sweet balsamic odour and taste.

The styptic properties of this preparation are due to the immediate coagulation of blood or albuminous substances in general which it produces, assisted by the presence of benzoic acid. Unlike carbolic acid, which is possessed of a destructive action over the lower grades of organic life, whether vegetable or animal, it acts by mere coagulation, thus excluding the air, the vehicle of numerous spores. These considerations induced the author to make experiments, with the view of obtaining a *carbolyzed* benzoinated solution of alumina, and of uniting the disinfecting power of carbolic acid with the antiseptic properties of benzoinated solution. He found that 3 per cent. ($\frac{1}{2}$ fl. oz. to pint) of carbolic acid could easily be incorporated into the first-named preparation. From the fact that the carbolic acid is easier taken up by a basic alumina solution than by water, it may be possible that it exists in the same as carbolate of alumina, which, however, is to be proved by further experiments. Carbolyzed solution of alumina may be used in the same way and mode as the benzoinated preparation. It is a clear liquid of 1.25 to 1.27 sp. gr.;

the odour of carbolic acid is but slight, it being overpowered by that of benzoin. If exposed to cold it becomes slightly turbid, but will clear again on elevation of temperature.

Laforest's Lotion Cosmetique. A Black Hair Dye. (*Pharmaceut. Zeitung*, 1878, No. 16.) This preparation is recommended for dyeing the hair black. It is made by heating together 360 grams of claret, 4 grams of common salt, 7 grams of sulphate of iron, and 4 grams of oxide of copper, and then adding 7 grams of powdered galls. The hair is uniformly moistened with this lotion, then rubbed with a warm dry cloth, and finally washed with water.

Preparation of Permanent Rennet Essence. H. Soxhlet. (*Dingl. polyt. Journ.*, ccxxviii., 341-349. From *Journ. Chem. Soc.*, Oct., 1878.) For the preparation of concentrated solutions, only dried calves' stomachs are suitable, and those which have been blown out with air and dried as quickly as possible are best. The small stomachs of the youngest animals are richest in ferment. Fresh stomachs are useless for preparing a concentrated essence, as they yield a thick jelly which, by filtering, gives only a small quantity of liquid. Concentrated extract prepared from stomachs after fourteen days is light yellow in colour, whilst that prepared after six to eight months' storage of the stomachs is dark brown. This results from slight decay of the stomach, and as the colour does not affect the usefulness of the product, it is advisable to use stomachs which have been stored for at least three months. The portion of the stomach without folds, the *portio pylorica*, is cut away, as it is poor in ferment.

Acid liquids are usually employed for extracting, as they seem to produce richer solutions; but this is only because they act more quickly at first than water alone. Hydrochloric acid, containing 0.1 and 0.2 per cent. of acid, in two days gave extracts twice as rich in ferment as an aqueous one; but after eight days all three solutions were equally strong. A little thymol was added to prevent decomposition during the experiment. When the temperature is raised to 30°-35°, water acts more rapidly than the acid, and the solution is richer than that produced by acid at the ordinary temperature.

Attempts were made to produce concentrated solutions by means of dilute acids, but without success. A 0.3 per cent. solution of salicylic acid gave a liquid which was quite fresh after twelve months, but after only two months its activity had fallen off to the extent of one-half.

A series of experiments made with solutions of common salt

containing from 2 to 26 per cent. shows that solutions containing 3 to 6 per cent. of salt yield the liquids richest in ferment and capable of the highest degree of concentration.

The property of dilute salt solutions depends on the fact made known by Graham, that common salt is a very easily diffusible substance. Organic acids in combination with common salt are no better extractive agents than the salt alone. 5 per cent. solutions of sodium or potassium sulphate are less efficacious than the same strength of salt solution. Potassium chlorate behaves in much the same manner as common salt; an excess of the potassium chlorate, however, neither acts as efficiently as a precipitating agent, nor as a preventive of decomposition.

60 to 80 grams of calf's stomach steeped for five days in 1 litre of a 5 per cent. solution of common salt at ordinary temperatures, yield a solution of which 1 vol. will coagulate 10,000 vols. of new milk at a temperature of 35° in forty minutes. If the filtered solution is treated with 60 to 90 grams more of stomach, a solution of double strength is obtained; another repetition gives a solution three times the strength of the original one.

To prevent decomposition, about 0.3 per cent. of thymol may be added to the concentrated rennet extract solution. Possibly a slight taste due to this may be detected in the finest cheese, but for the same reason oil of cloves is much more objectionable. Boric acid is on all accounts the best antiseptic to employ, and solutions to which it has been added may be kept in covered vessels for months.

All extract solutions lose strength on keeping; during the first two months the solution may become 30 per cent. weaker; then the strength remains nearly constant for eight months in the case of a solution of 1:18,000. Alcohol is almost as good an antiseptic as boric acid, if the solution be preserved in well-stoppered flasks.

Detailed experiments are given, showing that the time required to coagulate milk is inversely proportional to the strength of the extract solution. From this the strength of a solution can be determined by adding 1 c.c. to 1 litre of milk at 35° , and noting the time required to coagulate the milk; this time multiplied by 10 gives the time for the proportion 1:10,000.

Aristocratic Remedy for Itch. (*Druggists' Circular.*)

Balsam of Peru	1 ounce.
Benzoic Acid	110 grains.
Oil of Cloves	40 drops.
Alcohol	2½ drams.
Simple Cerate	7 ounces.

Dissolve the essential oil and the benzoic acid in the alcohol, and mix them with the cerate. Lastly add the balsam of Peru. It is said to effect a cure in twenty-four hours.

Bismuth Ointment. Dr. Sweet. (*Chem. and Drugg.*, 1879, 295.) The author calls attention to the value of the subnitrate of bismuth as an external application. Whenever Erasmus Wilson recommends the oxide of zinc ointment, he uses bismuth, and with much more satisfactory results. Zinc ointment he finds too stimulating for any acute eruptions. But the bismuth fulfils the indications perfectly. Mixed with cosmoline or fresh lard, in almost any proportion, it is a sovereign remedy for eczema, herpes, intertrigo of infants, and anything where there is an abraded or irritated surface. A short time since he succeeded in healing an extensive ulcer of the leg, which had resisted other treatment. It is also an excellent application for piles, applied as an ointment externally, or injected in the form of a solution—a teaspoonful to a few ounces of water or other fluid.

Boro-Carbolie Lint and Cotton. E. Solger. (*Pharmaceut. Centralhalle*, 1878, 482.) The lint or cotton is saturated with a solution of ten parts of boracic acid and two parts of pure carbolie acid in one hundred parts of hot water and five parts of alcohol. The solution should be used while hot, or, if cold, should be reheated to above 50° C., and the saturated lint or cotton should be applied as a bandage before cooling.

A New Disinfectant. Dr. Day. (*Apoth. Zeitung*, 1879, 2.) Clothes, furniture, carpets, books, papers, etc., may, according to the author, be effectually disinfected without suffering the slightest injury, by means of a mixture of one ounce of rectified oil of turpentine, seven ounces of benzin, and three drops of verberna.

The Cobalt Hygrometer. (From *New Remedies*.) Unsized paper, as thin blotting or filtering paper, is to be dipped into a solution of chloride of cobalt, common salt, and a little gum arabic. It is red at first, but while drying becomes more pink, bluish red, and finally blue when dry. As the paper thus prepared is slightly hygroscopic, it will easily attract atmospheric moisture, and be coloured more or less reddish in proportion as it finds more moisture to attract. If it is to be used in very dry climates, a little glycerine or chloride of lime may be added to the solution, when it will be more capable of indicating the difference in moisture in comparatively dryer kinds of air. A good addition to this arrangement is a disc painted with half a dozen or more shades of red and blue for com-

parison, as enumerated below, which shades may then be marked thus :—

Rose-red.	Pink.	Bluish-pink.	Lavender.	Violet.	Blue.
Rain.	Very moist.	Moist.	Middling.	Dry.	Very dry.

Indestructible Ink. The *Apotheker Zeitung* gives the following formula :—1·74 grams aniline-black are ground up with 60 drops hydrochloric acid and 42 grams alcohol, and the liquid is diluted with a hot solution of 2·5 grams gum arabic in 170 grams water. If the aniline-black solution is diluted with a solution of 2·5 grams shellac in 170 grams spirit instead of gum water, the result is an ink suitable for writing on wood, brass, or leather.

Indestructible Writing Ink. (From *New Remedies*, 1879, 186.) The following formula is recommended :—Shellac, 4 parts; borax, 2 parts; soft water, 36 parts; boil in a close vessel till dissolved; then filter, and take of gum arabic, 2 parts; soft water, 4 parts. Dissolve, and mix the two solutions together, and boil for five minutes as before, occasionally stirring to promote their union; when cold, add a sufficient quantity of finely powdered indigo and lampblack to colour; lastly, let it stand for two or three hours, until the coarser powder has subsided, and bottle for use. Use this liquid with a clean pen, and keep it in glass or earthen inkstands, as many substances will decompose it in the liquid state. When dry it will resist the action of water, oil of turpentine, alcohol, diluted sulphuric acid, diluted hydrochloric acid, oxalic acid, chlorine, and the caustic alkalies and alkaline earths.

Blue-Black Writing Ink. (*Canadian Pharm. Journ.*, Feb., 1879.) Digest together for a fortnight 18 ounces of bruised galls, half ounce bruised cloves in 10 wine pints of water. Press and filter. Add to the clear liquid 6 ounces of sulphate of iron and 2 fluid drams of sulphuric acid, shaking well until solution is effected. Next add 1 ounce of indigo paste, and filter if necessary. The ink must be kept in well-corked bottles, and it should be made in vessels of glass or stoneware.

Removal of the Odour of Musk. (From *New Remedies*.) Mr. E. Biltz states that the disagreeable persistence of the odour of musk, on the hands and on utensils, may be readily removed by powdered ergot. About a teaspoonful of the latter is placed into the hollow of the hand, warm water is added to make a thin paste, and both hands are then well rubbed with it. The odour immediately disappears, and does not return. The author made this observation whilst making some powders containing musk and

ergot; he had triturated the musk with sugar previous to the addition of the ergot, otherwise the resulting odourlessness of the mixture might have caused him to doubt whether he had added any musk or not.

Experiments on Disinfection. (From *Medical Times and Gazette*, June 7, 1879.) Two sets of important researches on disinfection have been lately going on at Berlin. In both the test of the efficacy of the particular disinfectant used has been the effect produced by it either in destroying bacteria and vibriones in putrid fluids exposed to its action, or in preventing their development in a form of "Pasteur's fluid," in which the objects that had undergone disinfection in various degrees were immersed.

The first experiments, those of Dr. Mehlhausen, Director of the Charité Hospital, refer chiefly to the disinfection of rooms in which scarlet fever and other infectious cases have been. The result arrived at is that the most energetic and the cheapest disinfectant is sulphurous acid. Chlorine gas has the disadvantage of destroying clothes and furniture exposed to it, while it is less easy to manipulate, and four or five times as expensive as sulphurous acid. 20 grams of sulphur per cubic metre of space, destroy, when burnt in a closed room, all bacterial life in sixteen hours. Besides blocking up the doors and windows, Mehlhausen advises that the room shall be previously warmed, if the weather is cold, in order to prevent the gas finding its way into the neighbouring apartments. It is also advisable to damp the floor before lighting the sulphur, so as to profit by the great solubility of sulphurous acid in water. Eight hours is long enough to keep the room shut up after the sulphur begins to burn, and at the end of that time any clothes or bedding in it will be effectually disinfected. Mere free exposure of an infected room to the air by allowing the windows to stay open several days is not enough to disinfect it. This has been practically proved at the Charité Hospital after scarlet fever and measles in several instances.

The second series of experiments was made by Dr. Wernich, of Breslau, in the chemical laboratory of the Berlin Pathological Institute, upon the disinfecting power of sulphurous acid and of dry heat. The method adopted consisted in preparing an "infecting material" by steeping woollen threads, pieces of linen rag and cotton wool, previously proved to be free from atmospheric organisms, in putrid solutions of fæces or meat, and gently drying them. These substances were then tested for their capability of producing bacteria by means of the modified Pasteur's fluid above men-

tioned, which consisted of distilled water, 100 parts; cane-sugar, 10 parts; ammonium tartrate, 0.5 part, and 0.1 part potassium phosphate. This solution was freshly prepared before each set of experiments, filtered, boiled for half an hour, and immediately poured into the test glasses and preserved with the usual precautions. To test the effect of disinfection, the wool or wadding, after exposure for a definite time to a definite degree of heat in an oven, or to a measurable volume of sulphurous acid in a bell-glass, was immediately transferred to the Pasteur's fluid, and the efficacy of the disinfectant was estimated by the rapidity of development of bacteria if such appeared, or by their complete absence, as indicated by the fluid remaining perfectly cloudless. It was thus found that 3.3 per cent. of sulphurous acid by volume failed, even after many hours, to prevent the development of bacteria; but that if the amount of gas reached from 4.0 to 7.15 per cent. by volume of the contents of the bell-jar, and the process had gone on for at least six hours, no bacteria at all developed. On the other hand, while exposure to a temperature of 110° to 118° C., even for twenty-four hours, failed to destroy the bacterial germs, five minutes' exposure to one of 125° C. to 150° C. invariably succeeded, and the test fluid remained clear even for eleven days or longer. Dr. Wernich specially reminds us that his results must not be taken as applicable to all forms of bacteria, some of which probably require severer measures for their complete destruction. He also points out that it is easier to disinfect wool than linen, and that cotton wadding is the most difficult of all to free from infectious germs.

Preparation of Phosphorus Paste. Dr. E. Mylius. (*Pharmaceut. Zeitung*, 1879, No. 43.) 800 parts of wheat flour are intimately mixed with 5000 parts of water, gradually heated with it to 100° C., and allowed to cool to 30° , the mixture being well stirred all the time. A solution of 150 parts of phosphorus in 60 parts of carbon bisulphide is gradually added to a mucilage made of 10 parts of gum arabic, 15 parts of tragacanth, and 150 parts of water, the mixture briskly triturated so as to form a perfect emulsion, and then incorporated with the flour paste previously cooled to 30° . The paste may be coloured with smalt, if desired. It is put up in wide mouth bottles and well corked as soon as it is made, and will then keep for any length of time. It contains the phosphorus in a much more uniformly distributed condition than any similar preparation met with in commerce.

Improvement in the Application of Blisters. G. Danneccy. (*Archiv der Pharm.*, April, 1879, 467.) Owing to a partial absorp-

tion of cantharidin through the skin, the application of *emplastrum cantharides* is not unfrequently followed by strangury and other troublesome symptoms in the urinary organs. Powdered camphor and opium have been recommended to be strewed on the spread plaster to obviate these effects, but have not proved successful. The author finds bicarbonate of soda similarly applied to be an effectual means of preventing these symptoms. He covers the spread blister with a mixture of equal parts of the bicarbonate and powdered cantharides, and fixes the powder by pressing it on with the hand or a warm knife.

Pyrogallic Acid as a Hæmostatic. Prof. Husemann. (*Pharmaceut. Zeitung*, 1879, 204.) The author calls attention to the very successful results obtained by Dr. Vesey in the treatment of hæmorrhages of the lungs and stomach by means of pyrogallic acid, administered in doses of 0.05 gram every hour or two. In his opinion, this remedy is likely to prove a valuable substitute for ergot.

Artificial Cataplasm. M. Volkhausen. (*Pharmaceut. Zeitung*, 1879, 95.) This cataplasm is intended as a substitute for ordinary linseed poultice, and consists of pieces of white thick felt paper saturated with a decoction of linseed. When required for use, the paper is allowed to swell by dipping it into hot water; it is then applied to the affected part, covered with gutta serena tissue, and allowed to remain for twelve hours, after which it may be renewed by a fresh one.

Ostrich Pepsine. A. Ebelot. (*New Remedies*, March, 1878.) When eating the ostrich, the Indians always carefully put aside the stomach in order to collect the pepsine which it contains. "The stomach of the ostrich," says the author, "is celebrated for its incredible powers of digestion. The abundance of pepsine to which it owes this faculty, has created among the Indians a curious commercial fraud. They dry it and sell it literally for its weight in gold. It is used for the purpose of restoring worn out stomachs." A London medical journal says: "We think 'ostrich pepsine' such a splendid name for business purposes, that we wonder it has never been adopted. The pepsine of the pig would have no chance in competition with that of the ostrich, and no great city dinner or regimental mess would be complete without a supply of this infallible specific, *pour refaire les estomacs délabrés*."

Experiments with Disinfectants. G. B. Longstaff and E. H. Hare. (*Chem. and Drugg.*, August, 1878, from the *Sanitary Record*.) The authors report a series of experiments made by them with a

number of popular disinfectants. They took a quantity of urine, diluted it with water, and measured 100 c.c. into each of thirty-four jam pots. They then added to each part the one-thousandth part of its weight of a disinfectant, making each experiment in duplicate. In two cases they added water only. The results were as follows:—

Antiseptic, 0·1 per cent.	Day on which mould appeared.		Day on which putrefactive odour was distinct.	
	I.	II.	I.	II.
Water only	9	9	14	13
Terebene (Dr. Bond's)	10	10	13	18-23 ?
Carbolic Acid (Calvert's No. 5)	None by	75th day	None by	75th day
Burnett's Fluid	9	9	12	12
Condy's Red Fluid	10	13	15	10
Turpentine	13	14	18-23 ?	18-23 ?
Chloralum	8	8	10	11
Borax	8	9	18-23 ?	18-23 ?
Cupralum (Dr. Bond's)	8	8	12	12
Ferralum (Dr. Bond's)	None by	14th day	8	8
Sodium Salicylate	10	10	14	14
Sanitas (Aromatic, No. 3)	8	9	9	10
Sanitas (Inodorous, No. 3)	9	9	15	11
McDougall's Fluid	12	9	13	12
Sanitas (Aromatic, No. 1)	9	9	14	14
Sanitas (Inodorous, No. 1)	9	8	15	11

Artificial Fruit Essences. J. M. Maisch. (*Amer. Journ. of Pharm.*, March, 1879.) Since several very important errors had crept into the formulæ of Kletsinsky, as published in 1867, it has been thought best to republish all the formulæ from Wittstein's "Vierteljahresschrift," xvi., 268. These formulæ are given in *parts by measure* for 100 parts of alcohol, and whenever acids are used they are to be previously dissolved in alcohol.

Essence of Apple.—Aldehyd, 2 parts; chloroform, acetic ether, nitrous ether, and oxalic acid, each 1 part; glycerin, 4 parts; amyl-valerianic ether, 10 parts.

Essence of Pear.—Acetic ether, 5 parts; amyl-acetic ether and glycerin, each 2 parts,

Essence of Cherry.—Benzoic ether, acetic ether, each 5 parts glycerin, 3 parts; cinnanthic ether and benzoic acid, each 1 part.

Essence of Black Cherry.—Benzoic ether, 5 parts; acetic ether, 10 parts; oil of persico (peach kernels) and benzoic acid, each 2 parts; oxalic acid, 1 part.

Essence of Peach.—Formic ether, valerianic ether, butyric ether,

acetic ether, glycerin, and oil of persico, each 5 parts; aldehyd and amylic alcohol, each 2 parts; sebacylic ether, 1 part.

Essence of Apricot.—Butyric ether, 10 parts; valerianic ether, 5 parts; glycerin, 4 parts; amylic alcohol, 2 parts; amyl-butyric ether, chloroform, cœnanthic ether, and tartaric acid, each 1 part.

Essence of Plum.—Glycerin, 8 parts; acetic ether and aldehyd, each 5 parts; oil of persico, 4 parts; butyric ether, 2 parts, and formic ether, 1 part.

Essence of Grape.—Cœnanthic ether and glycerin, each 10 parts; tartaric acid, 5 parts; succinic acid, 3 parts; aldehyd, chloroform, and formic ether, each 2 parts; and methyl-salicylic ether, 1 part.

Essence of Currant.—Acetic ether, tartaric acid, each 5 parts; benzoic acid, succinic acid, benzoic ether, aldehyd, and cœnanthic acid, each 1 part.

Essence of Strawberry.—Butyric ether and acetic ether, each 5 parts; amyl-acetic ether, 3 parts; amyl-butyric ether and glycerin, each 2 parts; formic ether, nitrous ether, and methyl-salicylic ether, each 1 part.

Essence of Raspbrery.—Acetic ether and tartaric acid, each 5 parts; glycerin, 4 parts; aldehyd, formic ether, benzoic ether, butyric ether, amyl-butyric ether, acetic ether, cœnanthic ether, methyl-salicylic ether, nitrous ether, sebacylic ether, and succinic acid, each 1 part.

Essence of Pineapple.—Amyl-butyric ether, 10 parts; butyric ether, 5 parts; glycerin, 3 parts; aldehyd and chloroform, each 1, part.

Essence of Melon.—Sebacylic ether, 10 parts; valerianic ether, 5 parts; glycerin, 3 parts; butyric ether, 4 parts; aldehyd, 2 parts; formic ether, 1 part.

Essence of Orange.—Oil of orange and glycerin, each 10 parts; aldehyd and chloroform, each 2 parts; acetic ether, 5 parts; benzoic ether, formic ether, butyric ether, amyl-acetic ether, methyl-salicylic ether, and tartaric acid, each 1 part.

Essence of Lemon.—Oil of lemon, acetic ether, and tartaric acid, each 10 parts; glycerin, 5 parts; aldehyd, 2 parts; chloroform, nitrous ether, and succinic acid, each 1 part.

The different manufacturers of artificial fruit essences doubtless prepare them by formulæ of their own, and this explains the difference in the flavour, which is particularly noticeable on largely diluting them with water. If the essences have been prepared with a dilute alcohol, their odour is more prominent, and they are apparently stronger; but on mixing a small quantity with a large quan-

tity of water in given proportions, the true flavouring strength may be better discerned.

A fruit essence, which is much employed in the United States, is *essence of banana*; it consists usually of butyric ether and amyl-acetic ether, equal parts, dissolved in about 5 parts of alcohol.

The red colour of strawberry and raspberry essence is produced by anilin red (fuchsin), the bluish tint of which is conveniently neutralized by a little caramel. If caramel alone is used for colouring essence, a yellow or brown colour is obtained, according to the quantity used.

The *Confectioners' Journal* gives formulæ also for the following essences:—

Essence of Blackberry.—Tincture of orris root (1 to 8), 1 pint; acetic ether, 30 drops; butyric ether, 60 drops.

Essence of Nectarine.—Extract of vanilla, 2 parts; essence of lemon, 2 parts; essence of pineapple, 1 part.

Harmlessness of Salicylic Acid. Prof. Kolbe. (*Journ. für pract. Chem.*, xvii., 347.) The author disputes the assertions that the long-continued internal use of small doses of this acid is in any way injurious to health. He has himself taken 1 gram of the acid daily for twelve months, and never felt the slightest ill effect; on the contrary, he finds his power of digestion much improved, and his general health better than before.

Oxalic Acid not a Poison. Dr. E. Pfeiffer. (*Archiv der Pharm.*, xiii., 544.) The author quotes the results of experiments by Dr. J. Uppmann, according to which oxalic acid, contrary to the general supposition, is not a poison. He thinks, however, that, as the experiments were made on dogs, the large quantity of phosphate of calcium usually contained in the stomachs of these animals may have rendered the oxalic acid harmless by converting it into calcium oxalate, which, owing to its comparative insolubility, is not likely to produce toxic effects. In the author's opinion, experiments on men require to be made before the non-poisonous nature of oxalic acid can be considered as established.

Best Blacking for Boots and Shoes. (*Chem. and Drugg.*, February, 1879.) Ivory black, $1\frac{1}{2}$ ounce; treacle, $1\frac{1}{2}$ ounce; sperm oil, 3 drams; strong oil of vitriol, 3 drams; common vinegar, half-pint. Mix the ivory black, treacle, and vinegar, then the sperm oil and oil of vitriol separately, and add them to the other mixture. This will be found an excellent and useful receipt.

Petroleum as an Insecticide. W. Taylor. (*Ibid.*, from *Journ. of Horticulture*.) The author reports most favourably on the virtues

of petroleum as a murderer of "mealy bug, scale, and the terrible red spider." Put a wineglass of petroleum in a gallon of water. Then make two or three squirts with a syringe into the vessel containing the mixture, and then immediately one syringeful over the plant, and afterwards alternately squirting one into the vessel and one on the plant, it will be kept sufficiently mixed for all practical purposes. Thus used it will kill red spider and all but the very oldest scale, although its shelly covering has become somewhat hardened, while it will not injure the tenderest ferns. "I have no mealy bug to try it on, but from what I have heard I have not the least doubt of its effects on that terrible pest." The application beats hollow all the old recipes for killing insects.

Preparation of Artificial Animal Charcoal. J. Pilter. (From *Biedermann's Centralblatt*.) The author proposes to obtain a cheap form of gelatin by treating leather waste mixed with from 1 to 5 per cent. of caustic soda with steam at a pressure of six atmospheres, in closed iron vessels. The resulting semi-fluid mass is placed in a centrifugal, which keeps back the gelatin whilst tannate of soda runs off. So much of this jelly as is equal to 33 kilos. of dry glue is mixed with 50 kilos. bibasic phosphate of lime, and 17 kilos. phosphate of magnesia. The mass is submitted to strong hydraulic pressure between layers of felt, dried at 110° , and ignited in the ordinary manner.

Rapid Filtration. Dr. Ebermayer. (From *New Remedies*.) The author reports that he has found muslin, which is folded in the shape of a filter, and placed below the latter, to be an excellent promoter of rapid filtration. He had occasion to make use of such additional muslin filters for the purpose of removing the filter-papers from the funnel without tearing, and he thereby had occasion to notice this useful property of the additional muslin filter.

The Preparation of Sapo Viridis. E. B. Shuttleworth. (*Canad. Pharm. Journ.*, June, 1878.) The author finds that the various formulæ for the preparation of *sapo viridis*, published during the last four years, fail to give satisfactory products, chiefly on account of an insufficiency of alkali. This defect he notices particularly in the formula recommended by H. Betz (see *Year-Book of Pharmacy*, 1878, 385), in which the quantity of solution of potash ordered is only about one-third of that required for saponification. In correcting this error he gives the following practical directions regarding the process:—

In a clean pot or dish, preferably of iron or copper, and capable of containing at least three times the quantity, put one part by

weight, of linseed oil; heat gently, and add in two portions three parts in all, by measure, of liquor potassæ, U. S. P. or B. P., providing either come up to the standard requiring 5·8 and 5·84 per cent. of hydrate of potash. Boil quietly and stir frequently until the mass becomes clear, which, with four ounces of oil and twelve fluid ounces of liquor, will require about an hour, and with ten pounds of oil about five hours. If, during the process, the mass becomes too thick to stir easily, add a little water. Allow the soap to become cool, but before it sets work in the colouring matter, which must be previously prepared by boiling finely powdered indigo with water until the colour is formed into a thin paste. Twenty grains of indigo boiled with one and a half ounces of water, until the mixture is reduced to about one dram, will answer for the soap from four ounces of oil. The soap must not be too hot, nor must it be reboiled after adding the colouring, or the green will be destroyed. A Berlin ware or Wedgewood dish may of course be used instead of iron or copper, but as the boiling point of the mixture is high, there is great liability of fracture, and cold water must be added very cautiously, and the stirring must be almost continuous.

The product will be about twice the weight of the oil used, and should be a dull bottle-green colour, and in consistence at least not thicker than lard or butter at moderate temperatures, just so that it will retain its form, and might be carried on paper.

Genuine green soap should be made from hempseed oil, and is largely used in France, Germany, and other continental countries, where it is almost universally employed in the household. It is not, however, always made from this, but often from other vegetable and perhaps animal oils, and is then coloured in the manner above indicated.

Aluminium Sulphate as a Disinfecting Agent. A. Tedesco. (*Chem. Industrie*, No. 4, April, 1879.) The author is of opinion that aluminic sulphate has been recently proposed as a means of disinfection, for which purpose he considers it eminently adapted. He ascribes to it the following action:—The ammoniacal products of decomposition are fixed as ammonium sulphate; the liberated aluminium hydrate carries down all suspended particles, forming with them a solid precipitate. The organic cell, in contact with aluminous compounds, absorbs alumina with great avidity, losing thereby its vegetative power, and putting an end to the process of decomposition. He considers bauxite and wochenite the best materials for the preparation of a sanitary sulphate of alumina.

Kaolins are readily attacked by sulphuric acid, but are poor in alumina and comparatively costly.

Subnitrate of Bismuth and Oxide of Zinc. Prof. Gubler. (*Chem. and Drugg.*, 1878, 458, from *Bull. de l'Academie.*) The author remarks that subnitrate of bismuth, like all other dry powders, is a mechanical absorbent. It is also a reliable antacid; for while it does not attack carbonic acid, it entirely absorbs the excess of normal acids in the gastric juice, and especially those formed accidentally by the decomposition of alimentary and other matters in the *primæ viæ*—acetic, lactic, and volatile fatty acids. The basic salt has the further great advantage that it absorbs sulphuretted hydrogen, and by double decomposition forms with sulphide of ammonium, nitrate of ammonium, and sulphide of bismuth. Few substances can replace bismuth in this respect. Chalk, otherwise so cheap, handy, and inoffensive, does not combine with sulphuretted hydrogen. Oxide of zinc alone fulfils all the functions of bismuth, but it easily becomes nauseating and emetic. It is noteworthy that this inconvenience only occurs when small doses ($\frac{1}{20}$ to $\frac{1}{5}$ gram) are employed. These always meet with sufficient acid in the stomach to convert them into neutral salts. When larger doses, from $\frac{1}{2}$ to 4 grams a day, are given, emesis never occurs, especially when sufficient sodium bicarbonate is given with it to neutralize the acids in the *primæ viæ*. This compound acts quite as efficiently as bismuth in the cases in which the latter is specially indicated. Zinc oxide has this advantage over bismuth, that its sulphide is white, so that it neither masks the presence of blood in the stools, nor makes the timid fear the presence of *melæna*.

Adulterations of Soft Soap. E. Piccard. (*Chem. and Drugg.*, from *Bull. du Musée de l'Industrie.*) 100 parts of fatty matter, combined with soda or potash, yield 230 to 235 parts of pure soft soap, containing 33.14 per cent. of water. When certain adulterants are added, in quantities too small to affect the appearance of the soap, 100 parts of grease will yield 320 to 340 parts of what would be a good commercial article, containing 33 to 38 per cent. of water. The same quantity of grease can be made to produce 380 parts of soap, containing as much as 52 per cent. of water. The adulterants generally used are clay, resin, fecula, and silicate of soda. All are added to increase the yield of soap, and the proportion of water it can contain. Clay is the most harmless of these adulterants. It is partly dissolved by the alkali, but makes the soap opaque, and is easily detected by its insolubility

in water. It increases the amount of water required to bring the soap to the proper consistence, but is not otherwise harmful. It is less and less employed every day. Resin combines with alkali, but the resulting compound "possesses none of the emollient qualities of fats." It retains large quantities of water, but alters the emollient and detergent power of the soap, and makes it more caustic and corrosive. Soaps adulterated with resin only are clear, brilliant, and transparent; more soluble in water than pure soap. They nearly always retain a slight odour of resin, which is most noticeable when the soap is warmed. Their colour is often redder than usual. They attack the skin and make linen yellow. Fecula is very harmful, especially when combined with silicate of soda. It is generally employed with three or four times its weight of lye, water, or silicate of soda. Soap made with it contains an excess of alkali, and a very large quantity of water. It is more or less opaque, as the proportion of starch is large or small; it is easily soluble in water; it is much affected by changes of temperature; and its detergent power is much lessened by the large proportion of water it contains. The latter fault is partly concealed by making it excessively alkaline; it is then corrosive, and attacks and destroys the skin, colouring matters, and woollen and silk goods. Analysis reveals the presence of the decomposition products of the latter in the water in which they have been washed. Silicate of soda with fecula is far the most injurious adulterant of soap, and it is also the one most usually employed. Almost all commercial soaps contain it. Silicate of soda in small quantity does not alter the appearance of the soap; but it is decomposed when used, and silica is deposited in the fibre of the flax or cotton, which cannot be removed, and rapidly destroys the tissues. Silk and wool are also attacked, and made more liable to be destroyed by alkalies. Water in which silk and wool have been washed with this soap contains considerable quantities of sulphur and ammonia resulting from the decomposition of the material. According to Dr. Vohl, linen and cotton cloths thus treated look, under the microscope, like worn fabrics—the fibres destroyed and the surface covered with a nap. Franklin said good bargains are sometimes ruinous. This is particularly true of soaps. Low-priced samples are never cheap; a larger quantity must be used to cleanse an equal amount, and fabrics are far more rapidly destroyed.

Bronzing Liquid. (*Pharmaceut. Centralhalle*, 1878, 416.) 10 parts of fuchsin and 5 parts of purple aniline are dissolved in 100 parts of alcohol of 95 per cent.; 5 parts of benzoic acid are then added to

the solution, and boiled with it for from five to ten minutes, or until the colour of the mixture changes to a bronze-brown, when it is ready for use. It is applied with a brush and allowed to dry, and will be found to answer well for all metals.

Preparation of Copal Varnish. The Composition of Copal and its Alteration by Fusion. H. Schwarz. (*Dingl. polyt. Journ.*, cccxxvii., 374-381; *Journ. Chem. Soc.*, July, 1879.) The best kinds of copal varnish are prepared by melting East Indian or East African copal, and dissolving the melted product in linseed oil varnish and turpentine oil. After being melted, the copal becomes soluble in ether, chloroform, benzene, and carbon bisulphide, but these solvents give a varnish which dries brittle. A brilliant varnish can be obtained by working up manganese borate and minium with the linseed oil, and then gently heating to decompose the oil.

The author describes the apparatus employed to melt the copal, and the necessary precautions to follow in the melting operations. Galvanized iron melting pots have been employed with advantage, instead of copper, which frequently gives a reddish sediment to the melted copal. A good copal varnish can be made by melting 1.5 kilograms of copal for twenty minutes with frequent stirring, then adding 3.5 kilograms of linseed oil varnish, and 1.75 kilograms of French turpentine oil.

An almost colourless specimen of copal, dried over sulphuric acid, gave on analysis $C = 78.72$, $H = 10.24$, $O = 11.09$. The author doubts the possibility of isolating the resins in copal by the alcohol method of Unverdorben, who considered that he had thus separated five resins from African copal.

When copal is successfully exhausted with cold dry ether, there remains undissolved a gelatinous swollen mass, which on that account the author terms "schwell-copal." Copal can be thus separated into two portions, one soluble and the other insoluble in ether.

Insoluble in Ether.—Copal contains 66 per cent. of "schwell-copal," hence the reason it is impossible to use crude copal for varnish making. "Schwell-copal" when once melted is rendered soluble in ether. Dried at 170° it gave $C = 79.95$, $H = 10.87$, $O = 9.18$.

Soluble in Ether.—The residue from ether remains liquid at 100° , owing to the presence of ethereal oil, which may be expelled by heating at 130° . Dried at 130° it gave on analysis $C = 78.25$, $H = 10.30$, $O = 11.70$. It is called soluble copal.

Melted Copal or Pyrocopal.—Copal when sufficiently melted to be

rendered soluble in the usual solvents loses between 5 and 12 per cent. by weight. The evolved gases were analysed, and gave per cent. $C O_2 = 35.6$, $CO = 32.20$, H and $CH_4 = 32.20$. Pyrocopal is dissolved by ether, benzene, carbon bisulphide, and carbolic acid, but is most soluble in chloroform; it is also dissolved by hot linseed oil and turpentine oil. It contains $C = 83.63$, $H = 10.36$, $O = 6.01$.

When a chloroform solution of pyrocopal is poured into absolute alcohol, a fine yellowish mass is separated, which is quite insoluble in alcohol. It is called "pyroschwell-copal." Dried at 100° it gave $C = 83.01$, $H = 10.52$, $O = 6.47$. Pyro-soluble copal was obtained from the alcoholic solution as a hard brownish resin. It contained $C = 81.02$, $H = 10.37$, $O = 8.61$.

In all cases melting the copal causes an increase on the percentage of carbon, and a decrease in oxygen and hydrogen. The author does not assert that the resins which are separated in this manner are absolutely definite compounds, but it is interesting to contrast the formulæ on the above data:—

Crude Copal, $C_{19}H_{30}O_2$.	Pyrocopal, $C_{19}H_{28}O$.
"Schwell-copal," $C_{48}H_{76}O_4$.	Pyroschwell-copal, $C_{48}H_{74}O_3$.
Soluble Copal, $C_{36}H_{56}O_4$.	Pyro-soluble Copal, $C_{36}H_{54}O_3$.

When cautiously distilled, copal gives but little carbonaceous residue; no compounds or products of decomposition have been obtained.

Nickel-plating of Steel or Iron. Prof. Stolba. (From *Zeitschr. des oesterr. Apoth. Ver.*) The author communicates the following simple process for coating objects made of iron or steel with nickel without the aid of a galvanic battery:—Add to a dilute (5–10 per cent.) solution of pure zinc chloride, enough nickel sulphate to impart a decidedly green colour to it, and heat to the boiling point in a porcelain vessel. There will be a separation of a basic zinc salt, which, however, should not be removed, as it does not interfere with the reaction. The objects to be coated, which must be *absolutely free* from grease or dirt of any kind, are now placed or suspended in the liquid in such a way as not to touch each other, and kept there for from thirty to sixty minutes, during which time the liquid must be kept boiling. As soon as the objects appear to be uniformly covered, which is always the case after boiling for about an hour, they are taken out, well washed with water in which a little chalk is suspended, and well dried. They may then be polished with chalk.

Gold and Silver Plating. (*Pharmaceut. Centralh.*, July 25, 1878, 282.) The following two formulæ are recommended:—

(1) Dissolve 10 grams of gold in 40 grams of hydrochloric acid and 15 grams of nitric acid; concentrate and evaporate off the acids as much as possible, precipitate the gold with ammonia, place on a filter and wash. Dissolve 100 grams of potassium cyanide in very little water, and dissolve the gold on the filter in this solution, always returning the filtrate to the filter until all brown particles are dissolved, then add sufficient distilled water to make 1 litre.

(2) Precipitate 20 grams of silver, dissolved in 60 grams of nitric acid, by an aqueous solution of 20 grams of caustic potash; place on a filter, wash with water, and dissolve on the filter in an aqueous solution of 100 grams of potassium cyanide; add water to make 2 litres.

Both solutions are used by immersing the bright metals which are to be plated in them.

Platinum Plating. Prof. Böttger. (From *Chem. and Drugg.*) The author announces that concentrated boiling solution of neutral citrate will dissolve large quantities of freshly-precipitated ammonio-platinic chloride. This solution decomposed by a couple of Bunsen's cells will deposit a "handsome, lustrous, perfectly homogeneous, and very tenacious coat of the purest platinum" on articles suitably prepared. The ammonio chloride is the only platinum compound which can be used for plating, and its slight solubility has hitherto made it impossible to obtain a satisfactory coating of the metal by electro-deposition.

Curious Decomposition of Calomel under the Influence of Iodine Vapour. E. Schaer. (*Ber. der deutsch. chem.-Ges.*, xii., 339.) The author reports upon a peculiar decomposition of calomel, brought about by prolonged exposure to air containing minute quantities of iodine vapour spontaneously evolved from iodine contained in a bottle not hermetically closed. The calomel bottle was found covered with a copious efflorescence of mercuric iodide and chloride. This change is explained by assuming that, in the first instance, the calomel split up into mercuric chloride and metallic mercury, and that the latter, while in a nascent state, was converted into mercuric iodide.

Detection of Minute Quantities of Indican in Urine. W. Weber. (*Archiv der Pharm.* [3], xiii., 340.) 30 c.c. of the urine are mixed and gently warmed with an equal volume of fuming hydrochloric acid and one or two drops of dilute nitric acid in a large test tube capable of holding 80 c.c. The colour of the mixture becomes

gradually darker, and ultimately brown, with occasionally a red or violet tinge. The tube is then immersed in cold water, and when quite cool a column of 2 to 3 centimetres of ether is poured upon its contents, after which the tube is closed with a piece of paper held on by the thumb, vigorously shaken, and allowed to stand. The ether, after rising to the surface, will appear covered with a bluish froth, which is best seen by holding the tube close to the eye against a white background. The ether itself will show a pink, carmine, or violet, and the aqueous stratum a pale brown colour.

Should the blue colour of the froth not show distinctly after a few minutes, it is recommended to add a few drops of alcohol to the froth, whereby the latter will rapidly disappear, and leave the uppermost layer transparent and distinctly blue.

Acetous Perfumes. (*Monthly Mag. of Pharm. From New Remedies.*)

1. *Concentrated Aromatic Vinegar.*

Concentrated acetic or glacial acetic acid	8 ounces.
Oil of lavender (English)	2 drams.
„ rosemary	1 „
„ cloves	$\frac{1}{2}$ „
Gum camphor	1 ounce.

2. *Hygienic or Preventative Vinegar.*

Strong brown vinegar	2 pints.
Gum benzoin	1 ounce.
Oil of marjoram	$\frac{1}{2}$ dram.
Brandy	1 pint.
Oil of cloves	1 dram.
„ lavender (English)	1 „

3. *Toilet Vinegar (à la Violet).*

White wine vinegar	2 pints.
Extract of cassia	$\frac{1}{2}$ „
„ orris	$\frac{1}{4}$ „
„ rose (triple)	$\frac{1}{4}$ „

4. *Toilet Vinegar (à la Rose).*

Extract of rose (triple)	$\frac{1}{2}$ pint.
Dried rose leaves	4 ounces.
White wine vinegar	2 pints.

5. *Vinaigre de Cologne.*

Eau de Cologne	1 pint.
Glacial acetic acid	1 ounce.

6. *Cosmetic Vinegar (Piesse and Lubin's).*

Concentrated vinegar	1 ounce.
Gum benzoin	3 „
Alcohol, pure	1 quart.
Balsam of Peru	1 ounce.
Oil of neroli	1 dram.
„ nutmegs	$\frac{1}{2}$ „

7. *Viniagre à la Rose.*

Glacial acetic acid	1 ounce.
Oil of rose	$\frac{1}{2}$ dram.

8. *White Wine Vinegar.*

Filter best ordinary brown vinegar through animal charcoal till perfectly white.

Ammoniacal Perfumes. (*Ibid.*)1. *Essence for Smelling Bottles.*

Stronger water of ammonia	1 pint.
Oil of rosemary	1 dram.
„ lavender (English)	1 „
„ bergamot	$\frac{1}{2}$ „
„ cloves	$\frac{1}{2}$ „

2. *Essence for Smelling Bottles.*

Stronger water of ammonia	1 pint.
Oil of bergamot	2 drams.
„ lemon	3 „

3. *Allchin's Volatile Essence.*

Stronger water of ammonia	1 pint.
Oil of bergamot	2 drams.
„ cloves	1 „
Essence of musk	4 „
Oil of rose	10 drops.
„ cinnamon	5 „

4. *Eau de Luce.*

Stronger water of ammonia	2 ounces.
Tincture of benzoin or balsam of Peru	1 „
Oil of lavender (English)	10 drops.
„ amber	5 „

Occurrence of Albumen in Healthy Urine. W. Leube. (*Archiv der Pharm.* [3], xiv., 281.) The assertion, repeatedly made, that

traces of albumen often occur in the urine of perfectly healthy persons, induced the author to examine the urine of a large number of soldiers for seven consecutive days. The morning urine was found to contain albumen in 5 cases out of 119, and the afternoon urine in 19 cases out of the same number; but in all these cases the quantity of albumen was considerably below 0.1 per cent.

The author arrives at the conclusion that there are two forms of physiological albuminuria: one in which albumen is secreted only after bodily fatigue; and another in which the secretion of albumen occurs without being caused by fatigue. The amount of albumen in such cases, however, seems to be but very small, and never to reach 0.1 per cent.

Oxalic Acid as a Disinfectant. Prof. Beilstein. (From *Brit. Med. Journ.*) The author refers to an observation made by M. Jeremin to the effect that a solution of oxalic acid is capable of absorbing large quantities of ozone, and that such a solution possesses considerable disinfecting power. The solution can be kept for a long time without losing its activity.

Note on Disinfectants. E. Reichardt. (*Archiv der Pharm.* [3], xiv., 385.) The various disinfectants and their relative efficiency have been investigated by the author, who considers the use of thymol, creasote, crude carbolic acid, carbolate and chloride of lime, tarry substances, a mixture of three to four parts gypsum and one of iron sulphate, the latter or unslaked lime alone, cleanliness, and whitewashing with lime or a mixture of three parts slaked lime and one chloride of lime, excellent precautions against and preventives of contagious diseases and epidemics; but warns against the addition of organic substances, or of iron sulphate to chloride of lime, as recommended by some physicians, claiming that they immediately combine with the free chlorine of the lime, which then in a combined state loses all its efficacy as a disinfectant. The author also strongly advocates the continual burning of a number of spirit flames in sick rooms as a valuable means of purifying the air and of destroying infectious matter.

Application of Carbon Bisulphide for Extinguishing Fires in Chimneys. (*Polyt. Notizbl.*, 1879, No. 6.) The application is as follows:—About 100 grams of carbon bisulphide, placed in an iron or earthenware dish, are ignited in the lower part of the burning chimney. The CO_2 and SO_2 thus generated, though heavier than air, are carried upwards by the current, and extinguish the fire in a few seconds.

This method has been found to answer very much better than the

burning of sulphur, as the combustion of the latter proceeds very slowly and imperfectly as compared with that of carbon bisulphide.

Preparation of Imitation Kumys. (*New Remedies*, June, 1879, from *Pharm. Zeitung*, No. 25.) Fill into strong champagne bottles good, fresh, unboiled cow's milk, to such a height that after the addition of 30 grams (1 oz.) of granulated or powdered sugar, and after corking, there would still be left at least an inch of empty space below the cork. Before corking, add a piece of fresh compressed yeast, about the size of two peas, then cork, and tie the cork firmly down. In place of compressed yeast, a teaspoonful of good beer yeast may be taken. The contents of the bottles are well shaken, repeatedly, then the bottles are placed in the cellar, where they are turned up and down a few times during the day. From and after the fifth day the mixture is ready, and may be drunk to about the twentieth day. It is best to prepare about six bottles full at the time, refilling each after it has been emptied and cleaned, so that the treatment, after being begun, may not be interrupted. On opening the bottles, the contents are very apt to foam over, hence the bottle should be opened while being held over a plate. It should never be opened where there may be any furniture or dresses about, which might be soiled by spattering.

A good milk-wine, or kumys, should have a homogeneous appearance, of the consistence of thin cream; should be effervescent when poured out, of an acidulous, agreeably vinous odour and taste, and should not be full of lumps, or taste like butter-milk.

On first using kumys, it produces loose bowels, but this effect soon passes off.

Explosive Gelatine. (*Pharm. Centralhalle*, July 18, 1878, 271.) This substance consists of 94 to 95 per cent. of nitro-glycerine and 5 to 6 parts of collodion, and is used as a substitute for dynamite, which it much surpasses in strength, besides having the advantage of not being decomposed by water. It was invented by Mr. A. Nobel, and owes its name to its resemblance to gelatine.

Extract of Tar. A. Ciullini. (*L'Orosi*, 1879, 148.) Place any convenient quantity of pure Norway tar into a glazed earthen or porcelain vessel, and infuse it three several times with boiling water, letting each infusion stand over the residue for a week, and frequently stirring. The liquids are then united, and treated with sufficient calcined magnesia until litmus paper is no longer reddened. After twenty-four hours the liquid is filtered, and evaporated with a gentle heat on a water bath to an extract, which is soluble in water and contains all the medicinal soluble constituents of tar.

Poisonous Effects of Chlorate of Potash. (*Archiv der Pharm.* [3], xiii., 449.) Several cases of poisoning by large doses of this salt are reported in the *American Journal of Pharmacy* (1878, pp. 39, 89, and 112-114). In one of these, reported by Mattison, the administration of 18 grams daily for four days was followed by vomiting and other serious symptoms, ending in death. In another instance 29 grams were taken at once, to prove the harmlessness of this salt, but death ensued seven days after the administration. Kennedy relates a case in which a child died under painful symptoms from the effect of 14.6 grams of chlorate of potash. Another child, only two and a half years old, died within seven hours after taking 15 grams of the same salt.

All these cases point to the necessity for great caution in the medicinal administration of large doses of chlorate of potash, especially in the case of children.

Mercury for Hypodermic Use. Dr. R. Kirk. (*Med. and Surg. Reporter*, from *Brit. Med. Journ.*) Respecting the best form of administering mercury hypodermically, the author gives the results of his experience as follows:—

Six solutions were used during my term of office; the bichloride with morphia; the albuminous solution of the bichloride; Savory and Moore's lamels; a simple aqueous solution of the bichloride; the biniodide, and the bicyanide. The last two were soon discontinued, as possessing no perceptible advantages over the others; but two series of comparative experiments with the other four were made with the utmost care. The first series was conducted to determine which produced the least irritation, and the patients were injected with all four solutions in rotation, with the result, rather surprising, I must admit, of showing that the simple aqueous solution of the bichloride, two grains to the ounce, produced as little irritation as any of the others. In the whole series of over three hundred injections, there was not a single boil, and only on rare occasions was there induration enough to cause tenderness. The second series showed that the amount of mercury required was the same, whatever solution was employed.

The only reasons to which I can ascribe these results are: thoroughly cleansing the syringe-needle before each injection, and inserting the needle perpendicularly and deeply into the subcutaneous tissue. I believe if these two points are carefully observed, that mercurial injections may be given with almost perfect safety, and with a solution so simple as an aqueous one of the bichloride.

Balata, a Substitute for Gutta-Percha. (*New Remedies*, Sept., 1878, from *Boston Journ. of Commerce*.) Balata, which has only been known for a short time, is inferior in the extent of its uses to caoutchouc, but surpasses gutta-percha, and is said to have already become an important article of commerce. It is the milky sap of the bully tree, that flourishes on the banks of the Orinoco and the Amazon, in South America. The operation of collecting the gum is similar in every respect to that employed with caoutchouc and gutta-percha, and need not therefore be described.

It resembles gutta-percha so closely in its general properties that much of it is shipped from Guiana and sold yearly for gutta-percha, although it has many points of superiority. It is tasteless, gives an agreeable odour on being warmed, may be cut like gutta-percha, is tough and leathery, is remarkably flexible, and far more elastic than gutta-percha. It becomes soft, and may be joined piece to piece, like gutta-percha, at about 120° F., but requires 270° F. before melting (higher than gutta-percha).

It is completely soluble in benzole and carbon disulphide in the cold. Turpentine dissolves it with the application of heat, while it is only partially soluble in anhydrous alcohol and ether.

It becomes strongly electrified by friction, and is a better insulator of heat and electricity than gutta-percha, on which account it may find considerable application for electrical and telegraphic uses.

Caustic alkalies and concentrated hydrochloric acid do not attack it; but concentrated sulphuric and nitric acids attack it as they do gutta-percha, which it closely resembles in all other properties.

Zinc Permanganate. A. Kupffer. (From *Chem. and Drugg.*) The author states that the commercial solution of zinc permanganate contains only 10, instead of 25 per cent., as stated. It is also contaminated with chlorides. It should be made by Gustavsen's method, viz.: by decomposing barium manganate with carbonic or dilute sulphuric acid, and adding to the solution of barium permanganate thus produced an equivalent quantity of zinc sulphate. The strength of the solution should not exceed 48 grains to the ounce.

Isinglass from Seaweeds. (*Amer. Journ. of Pharm.*, June, 1879.) A very interesting product, called "kanten," or vegetable isinglass—a species of gelose derived from either of the seaweeds, *Gelidium corneum* or *Plocaria lichenoides*—is made in China and Japan, and exported to Europe in flat and moulded tablets and in bundles of strips. It is known in Cochin China as "hai thao." It is soluble in boiling water only, of which it takes up about 500 times its weight. It is manufactured as follows:—

The seaweed, called by the native name of "tengusa," is carefully washed and afterwards boiled, so as to form a gluish decoction, which is strained off and put into square boxes. When cool, it forms into a stiff jelly, which can easily be divided into squares a foot in length. The manner in which the surplus water is removed is very ingenious. The jelly prisms are exposed in the open air during a cold night, and are allowed to freeze. During the day the sun melts the water, which runs off, leaving behind the skeleton of white horny substance, which is extremely light and easily dissolved in hot water; when cooled, it again forms a stiff jelly. This article can be applied to many purposes—for culinary uses, for making bon-bons and jellies, for clarifying liquids, as a substitute for animal isinglass, for making moulds used by the plaster of Paris workers, for hardening the same materials,—in short, as a substitute for all kinds of gelatine, over which it has the advantage of producing a firmer jelly.

Presence of Sulphur in Amber and Asphalt. O. Helm. (*Zeitschr. des oesterr. Apoth. Ver.*, 1879, 92.) Baudrimont found sulphuretted hydrogen among the products of the dry distillation of amber, and subsequently convinced himself of the presence of sulphur in all varieties of this resin. (See *Journ. de Pharm. et de Chim.*, 1864, 403.) These observations are confirmed by the author, who finds the proportion of sulphur to vary from 0.26 to 0.42 per cent. He also establishes the presence of sulphur in asphalt, in which he finds 8.26–10.85 per cent. of it in organic combination, 0.01–0.16 per cent. in combination of iron, and 0.19–0.40 per cent. of sulphuric acid.

Artificial Amber. (*Pharmaceut. Zeitung*, 1879, 257.) This preparation is composed chiefly of copal, camphor, and turpentine, and is extensively used as a substitute for genuine amber, which it closely resembles in appearance. It may be distinguished from the latter by its lower melting point, and by its readily softening in cold ether, in which real amber is left unaffected.

Kerite, a kind of Artificial Caoutchouc. (*Chem. and Drugg.*, February, 1879.) Kerite is the invention of Mr. Day, of New York, and is made as follows:—To produce 100 parts by weight of kerite, 27 parts of cotton oil and 30 parts of oil-tar are heated together in a cauldron for several hours, at a temperature of about 150° C. After this has been done, 30 parts of linseed oil, 12 parts of sulphur and 5 of ordinary wax or of solid paraffin, are added. The whole is then heated for five or six hours, at a temperature under 150° C., to prevent carbonization. It is then allowed to cool, and is moulded

into blocks convenient for future purposes. The price is about one-third of the natural caoutchouc. Mr. Day received honourable mention for kerite insulated telegraph core, exhibited at the Paris Exhibition.

Imitation Ebony. (*Ibid.*, from the *Revue Industrielle*.) The following recipe will answer to turn oak black so as to cause it to resemble ebony. The wood is immersed for forty-eight hours in a hot saturated solution of alum, and then brushed over several times with a logwood decoction prepared as follows:—Boil 1 part of best logwood with 10 parts of water, filter through linen, and evaporate at a gentle heat until this volume is reduced one-half. To every quart of this add from 10 to 15 drops of a saturated solution of indigo, completely neutral. After applying this dye to the wood, rub the latter with a saturated and filtered solution of verdigris in hot concentrated acetic acid, and repeat the operation until a black of the desired intensity is obtained. Oak thus stained is said to be as close as well as handsome imitation of ebony.

Formulæ for Cements. (*New Remedies*, February, 1879.)

Rubber Cement.—Digest caoutchouc, cut in fine shreds, with about 4 volumes of naphtha in a well covered vessel for several days. Naphtha should not be used indoors.

Cement for Mending Hard Rubber.—Fuse together equal parts of gutta-percha and genuine asphaltum; apply hot to the joint, closing the latter immediately with pressure.

Waterproof Cement.—Shellac, 4 ounces; borax, 1 ounce; boil in a little water until dissolved, and concentrate by heat to a paste.

Waterproof Cement.—Soak pure glue in water until it is soft, then dissolve it in the smallest possible amount of proof spirits by aid of a gentle heat. In 2 ounces of this mixture dissolve 10 grains of gum ammoniacum, and, while still liquid, add $\frac{1}{2}$ dram of mastic dissolved in 3 drams of rectified spirits. Stir well, and for use keep the cement liquefied in a covered vessel over a hot water bath.

Marine Glue.—Caoutchouc, 1 ounce; genuine asphaltum, 2 ounces; benzole or naphtha, q. s. The caoutchouc is first dissolved by digestion and occasional agitation, and the asphaltum is gradually added. The solution should have about the consistency of molasses.

Marine Glue (much used in batteries).—Dissolve 1 part of India-rubber in 12 parts of benzole, and to the solution add 20 parts of shellac (powdered), heating the mixture cautiously over a fire. Apply with a brush.

Pyrogallic versus Chrysophanic Acid. Prof. T. Husemann. (*Pharm. Zeitung*, xxiv., No. 14. From *The Pharmacist*.) The author

asserts that chrysophanic acid may be, and latterly has been, advantageously replaced by pyrogallic acid, the latter being free from irritating properties, while exerting the same beneficial influence on psoriasis and other lichenous affections of the skin in a superior degree. Hebra, the renowned dermatologist, has instituted comparative experiments in his clinic at the Vienna hospital, and finds that it may not only effect a cure where chrysophanic acid had failed, but that it does not produce those concomitant unpleasant effects of the latter, which have also been noticed by English physicians in the employment of the acid as well as of the Goa powder. A five per cent. ointment generally proves inert, the strength having to be increased to 20 per cent., under which circumstances severe inflammatory symptoms will frequently put in an appearance, which, when the scalp is annointed, may even extend to the eyelids and conjunctiva. Preference should be given to a salve consisting of 1·0 pyrogallic acid and 9·0 cold cream (or simple ointment), to be applied twice a day to the affected parts by means of a bristle brush, the spot to be covered over with cotton or linen. Where the psoriasis is very much extended, the patient should wear flannel next his body or dust himself over with *poudre*. Ointments containing 25 per cent. of the medicament are apt to produce deep excoriations and blisters, and must, therefore, be avoided. When the dressing is to be applied on linen, its strength ought not to exceed 1 to 2 per cent., as in this manner its action is much more intense. For the same reason an aqueous solution must not contain more than 1 per cent. According to Hebra, the external application of pyrogallic acid does not appear to superinduce any toxicological symptoms, although it is excreted by the kidneys.

Antiseptic Balsam. Dr. J. Felix's "Cicatrizing and Antiseptic Balsam." (*New Remedies*, November, 1878.)

Acid. Carbol. pur., liquefact.	4 partes.
Morphiæ Hydrochlorat.	1 "
Tinct. Arnice	10 "
„ Aconiti	10 "
Balsami Peruviani	25 "
Glycerinæ	50 "
Mix.	

Said to be an excellent application to malignant ulcers.

Creasote Wine. (*New Remedies*, November, 1878.)

Beechwood-tar Creasote	192 grains.
Tincture of Gentian	1 fl. ʒ.
Alcohol, 85 per cent.	8 fl. ʒ.
Malaga Wine, to make	1 quart.

Vaquelin's Anti-Asthmatic Cigarettes. (*New Remedies*, November, 1878.)

Sodium Arseniate	3 grains.
Extract of Belladonna	8 „
Extract of Stramonium	8 „

Dissolve the arseniate of sodium in a small quantity of water, rub it with the two extracts; then soak up the whole mixture with fine blotting paper, which is dried, and cut into twenty-four equal parts. Each part is then rolled up in a piece of cigarette paper.

Four or five inhalations from one cigarette are generally sufficient as a dose.

Liquor Pepsini Aromaticus. (*L'Orosi*.)

Saccharated Pepsin	16·5 parts.
Hydrochloric Acid	3·7 „
Glycerin	177·1 „
Orange-flower Water	236·0 „
Bitter Almond Water	2·0 „

Dissolve the pepsin in the aromatic waters, to which the acid has been added; then add the glycerin. Dose: one teaspoonful for children; a tablespoonful for adults.

Transparent Glycerin Jelly. (*Canad. Pharm. Journ.*) Dissolve 1 ounce of transparent soap in 4 ounces of water and 4 ounces of glycerin, with the aid of heat. While still warm add 20 ounces of glycerin. When cold, perfume to taste, and pour into glass jars. It is pale amber in colour.

Opaque Glycerin Jelly. (*Ibid.*) Mix four ounces of white soft soap in a mortar with 6 ounces of glycerin; then mix 4 drams of oil of thyme with 4 pounds of almond oil, and add this gradually to the glycerin and soap, taking care to incorporate each portion thoroughly before adding any more oil.

Vinous Solution of Extract of Cinchona. M. Barnicaud. (*Répert. de Pharm.*, 1878, 535.)

℞ Extr. Cinchon. flav. liq.	3 grams.
Vin. Cinchon. Malag.	30 „
Syrup. simpl.	100 „
Aquæ	1 litre.

Geranium Oil. (*Zeitschr. des oesterr. Apoth. Ver.*, xvii., 268. From *New Remedies*.) Under the name of geranium oil, several essential oils derived from species of *Pelargonium* and *Andropogon* come into commerce, which on account of their rose-like odour are used as

cheap substitutes for oil of roses as well as in its adulteration. The German true geranium oil, or oil of rose-leaved geranium, as well as the French geranium "palma rosæ" oil, are obtained from the *Pelargonium radula*, by distillation of the leaves and flowers with water. It is colourless; sometimes, however, with a greenish, yellowish, or even brownish colour, the latter especially being the most esteemed. It boils at 216° to 220° C., and solidifies at 16° C., and rotates a beam of polarized light to the right.

The smell is agreeable, and resembles that of the rose. The so-called Algerian rose-oil, from the leaves and flowers of the cultivated *Pelargonium roseum*, Willd., and *P. odoratissimum*, is very similar to the French oil, but is lævogyre, and is especially used in the adulteration of rose oil, but is itself adulterated with grass oil from various species of *Andropogon*.

The Turkish geranium oil (rosé or roshé oil, oil of rose geranium, ginger-grass oil) is the ethereal oil *Andropogon Pachnodes*, a grass indigenous to the East Indies, Persia, and Arabia. It is a yellowish thin liquid, with an agreeable aromatic odour, and does not readily solidify. It comes into commerce principally through Smyrna and Bombay, and is alleged to be prepared in Mecca.

The "palma rosæ" oil contains pelargonic acid, $C_9H_{18}O_4$, a colourless oily liquid, solidifying at a low temperature, melting at 10° C., and boiling at 260° C., it is one of the series of fatty acids. Among the other constituents of geranium oil are geraniol, $C_{10}H_{18}O$, isomeric with borneol, and a colourless liquid having an agreeable rose-like odour, which boils at 232° C., and upon heating with zinc chloride yields geranien, $C_{10}H_{16}$, as a colourless liquid, smelling of carrots, and boiling at 163° C.

According to Guibourt, rose oil, geranium oil, and andropogon oil may be distinguished by means of iodine, nitric acid, and sulphuric acid. Under a bell-glass is placed a capsule containing iodine, and around this are placed watch glasses containing one or two drops of each oil. The true rose oil retains its colour, whilst both the other oils turn brown, the geranium taking by far the most intense colour. If instead of iodine, copper filings over which nitric acid has been poured are put under the bell-glass, the glass becomes immediately filled with red vapour, which is absorbed by the oils, the geranium oil becoming apple-green, and the andropogon oil and rose oil dark yellow, the former most quickly. If one or two drops of each of these three oils are mixed with an equal quantity of concentrated sulphuric acid, the mixtures become brown; but while the mixture with rose oil retains its delicious

odour, that with the geranium oil smells strong and repulsive, and the andropogon oil acquires a strong fatty odour.

Pavesi's Hemostatic Collodion. The *L'Union Médicale* gives the following formula for this preparation:—

Collodion	100 parts.
Pure Carbolic Acid	10 „
Tannic Acid	5 „
Benzoic Acid	3 „

Mix.

Benzoate of Iron. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1879, No. 2.) This preparation has recently been used with success in the treatment of scrofula, in doses of $1\frac{1}{2}$ to 3 grams, three or four times daily, and has been previously recommended for the preparation of ferrated cod liver oil. It may be prepared as follows:—

37 parts of pure crystallized benzoic acid and 60 parts of acetic acid of 1·040 sp. gr. are added to a mixture of 100 parts of liquor ammoniæ of 0·960 sp. gr. and 1500 parts of water. To this solution is gradually added a mixture of 72 parts of solution of ferric chloride of 1·48 sp. gr. and 100 parts of water; the whole well agitated, and then allowed to stand for twenty-four hours, after which the precipitate is collected on a calico filter, washed with cold water, pressed, and dried in a moderately warm place. The product amounts to about 60 parts.

The composition of the precipitate is represented by the formula, $\text{Fe}_2 6 \text{C}_7 \text{H}_5 \text{O}_2 + \text{Fe}_2 6 \text{H} \text{O} + 12 \text{H}_2 \text{O}$.

Simple Mode of Testing Antimonium Sulphuratum for Arsenic. (*Pharmaceut. Centralhalle*, 1879, 181.) The sample to be tested is intimately mixed with an equal weight of sodium bicarbonate, the mixture shaken with cold distilled water for several minutes, the solution filtered, and acidified with hydrochloric acid. A yellow precipitate of $\text{As}_2 \text{S}_3$ will thus be formed if arsenic was present in the sample.

Iodoform Preparations. (*New Orl. Med. and Surg. Journ.*) The *Allgemeine Med. Central-Zeitung* for September 21 extracts from No. 18 of the *Mittheilungen des Vereins der Aerzte in Niederösterreich* some remarks on iodoform, and several formulæ for the use of this remedy.

Iodoform is given in doses of from 5 to 10 centigrams ($\frac{3}{4}$ to $1\frac{1}{2}$ grain) three or four times daily, in solution in ether, in powder, or in pills. For ointment, 1 part of iodoform is mixed with 8 or 10 parts of fat at the temperature of a water bath. Rubbed to a fine

powder, it is used for sprinkling and dressing varicose ulcers, cancerous and syphilitic ulcers, anal fissures, etc. Mixed with lycopodium, it is used for insufflation in vaginitis, and for sprinkling in the vulvitis of children.

Righini's Iodoform Paper.—Take of starch 20 parts, cold water, 15 parts. Mix, and add 100 parts of boiling water, or enough to make a softish paste, to which add 10 parts iodoform. The paste is then spread thinly on bibulous paper. The paper is used for disinfecting dwelling and sick rooms, strips being laid in different parts of the room.

Iodoform Suppository (Purdon).—Iodoform, 1 part; cacao butter, 25 parts. For application to the cervix or cavity of the uterus as an anodyne.

Iodoformized Cod Liver Oil.—Dissolve 1 part of iodoform in 200 of cod liver oil, and 0.5 of oil of anise seed. The dose is a tablespoonful twice or thrice daily in phthisis, glandular affections, and scrofula.

Anti-rheumatic Pills (Knoll).—Iodoform, reduced iron, each 3 grams ($46\frac{1}{2}$ grains); purified licorice juice, enough to make 60 pills, to be sprinkled with lycopodium. Two to be taken three times daily.

Anti-rheumatic Pills (Purdon).—Iodoform, $2\frac{1}{2}$ grams; reduced iron, 1 gram; licorice juice, 4 grams; water, sufficient to make 50 pills. Two or three to be taken every two or three hours in neuralgia and rheumatic affections.

Iodoform Pills.—Iodoform, extract of gentian, of each 5 drams; gentian root (powder), sufficient to make 100 pills.

Ethereal Solution of Iodoform (Gubler).—Iodoform, 2 parts; dissolve in spirit of wine, ether, of each 4 parts. To be painted over the painful parts in chronic arthritis, with a camel's-hair pencil; the parts afterwards covered in with oiled silk.

Anti-hæmorrhoidal Suppositories (Hilliaret and Purdon).—Iodoform $2\frac{1}{2}$ grams; cacao butter, 40 grams; yellow wax, 5 grams. Mix at a gentle heat, and make 10 suppositories.

Iodoform Ointment.—Iodoform, 5 parts; hog's lard, 45 parts; to be melted together at the temperature of a water bath, and stirred until cool. To be marked "for external use." In pruritus, prurigo, chronic eczema, fissures, and painful ulcers.

Sodium Benzoate as a Febrifuge. Prof. Klebs. (*Archiv der Pharm.* [3], xiv., 66.) The author reports most favourably on the value of this salt as an anti-pyretic. The effect is not so rapid as that of quinine or sodium salicylate, but it is surer and more lasting, and

is not accompanied or followed by any unpleasant symptoms, even after prolonged use. It may be given in doses of two grams, five or six times a day. It has also proved very useful in vesical catarrh and tuberculosis.

The salt is prepared by neutralizing solution of ammonia by benzoic acid previously suspended in water, then concentrating by evaporation, and allowing to crystallize over sulphuric acid under a bell jar. 25 grams of the salt can be taken in a day without any ill-effects.

Action of Sal Ammoniac on Chlorinated Lime. T. Salzen. (*Archiv der Pharm.* [3] xiv., 178.) Attention is called by the author to the energetic action of ammonium chloride on chlorinated lime, which is sometimes so violent as to cause explosions. No free ammonia is given off during this reaction if the chlorinated lime is of good quality, while with an inferior article, not properly saturated with chlorine, ammonia is always liberated. Liquor ammoniæ, when dropped on chlorinated lime, incites an energetic decomposition of the latter.

These reactions may possibly help to clear up the chemical constitution of bleaching powder.

Detection of Methyl in Ether and Chloroform. H. W. Langbeck. (*Chemiker Zeitung*, 1878, No. 39.) The test recommended by the author is as follows:—10 volumes of the ether or chloroform to be tested are mixed with 1 volume of a solution of silver nitrate containing 1.7 per cent. of this salt. The mixture is allowed to stand for twenty-four hours, after which the presence of methyl becomes manifest by a faintly reddish violet coloration at the line of contact between the two strata, or, in the presence of more than mere traces of the impurity, by the formation of a reddish brown precipitate of silver oxide.

Formulæ for the Preparation of Artificial Mineral Waters. (From *New Remedies*.)

I. CHEMICALS.

Many of these are employed in form of a standard 10 per cent. solution, which may be kept in stock, so that any mineral water can be prepared, in small quantities, at short notice. All quantities mentioned below are understood to be taken *by weight*, and the water used for making the solutions should be distilled.

1. Ammonium Carbonate, Solution.

Water of ammonia, sp. gr. 960	.	.	29 parts.
Carbonic acid water (at 4 atm.)	.	.	51 ..

To be preserved in well-closed vessels.

Contains 10 per cent. of ammonium carbonate.

2. *Ammonium Chloride, Solution.*

Ammonium chloride, pure . . .	1 part.
Water	9 parts.

Dissolve and filter. Sp. gr. 1030.

Contains 10 per cent. of ammonium chloride.

3. *Aluminium Chloride, Solution.*

Alumina, rendered anhydrous by faintly igniting in a porcelain crucible . . .	27 parts.
Hydrochloric acid, sp. gr. 1048 . . .	560 „
Water, sufficient to make	680 „

Digest the alumina in a flask with the acid for about two hours, with occasional shaking; then add the water and filter. Sp. gr. 1072-1073.

Contains 10 per cent. of aluminium chloride.

4. *Aluminium and Sodium Sulphate, Solution.*

Aluminium and sodium sulphate (or soda alum), dry	1 part.
Water	9 parts.

Dissolve. Let stand one day, and filter. Sp. gr. 1078-1079.

Contains 10 per cent. of soda alum.

5. *Barium Chloride, Solution.*

Barium chloride, cryst.	1 part.
Water	9 parts.

Dissolve and filter. Sp. gr. 1079-1080.

Contains 10 per cent. of barium chloride.

6. *Calcium Carbonate, Dry.*

Calcium carbonate, prepared by precipitating a solution of calcium chloride with an alkaline carbonate, and dried on the water bath.

7. *Calcium Chloride, Solution.*

Calcium chloride, hydrated	2 parts.
Water	13 „

Or sufficient to make a solution of sp. gr. 1088-1089 (at 17.5° C. = 63.5° F.).

The salt is prepared by adding to 32 parts of hydrochloric acid, sp. gr. 1120, 12 parts of white marble, and when effervescence has ceased, further adding 1 part of chloride of lime, and digesting for

1 day. The whole is then filtered, the filtrate evaporated, dried by gradually raising the temperature to 190° – 200° C. ($= 374^{\circ}$ – 392° F.), and the salt then transferred to well-closed bottles.

Contains 10 per cent. of calcium chloride.

8. *Calcium Fluoride, Dry.*

Native fluorspar, select white q. s.

Powder it in an iron mortar, sift it, and rub it in a porcelain mortar, with water, to an impalpable powder. Wash this first with very dilute nitric acid (1 part of acid to 50 of water), then with pure water, and dry.

9. *Calcium Sulphate, Dry.*

Calcium chloride, hydrated (see No. 7) 1 part.
Water 10 parts.

Dissolve, filter, and add it to a filtered solution of—

Sodium sulphate, cryst. 3 parts.
Water 30 „

Let the precipitate subside, decant, wash, and dry at a temperature not exceeding 40° C. Keep in well-closed bottles.

10. *Iron Chloride, Dry.*

(*Ferrous Chloride, or Protochloride of Iron.*)

Iron wire, cut 1 part.
Hydrochloric acid, sp. gr. 1120–1123 4 parts.
Water 3 „

Pour the acid on the iron wire contained in a rather large flask, and standing in a warm place, and shake it occasionally, until no more bubbles of gas are given off. Filter and evaporate the filtrate in a porcelain capsule to dryness. The dry residue is to be rubbed to a fine powder, and, under stirring, to be exposed on a plate to the solar rays until it is perfectly dry and white, and a small quantity dissolved in water does not give a blue reaction with potassium ferro-cyanide.

To be kept in well-closed, long, and narrow vials, exposed to solar light.

11. *Iron Pyrophosphate, Dry.*

Iron (sesqui-) chloride, cryst. 54 parts.
(or Solution of (sesqui-) chloride, sp. gr.
1482. 72 „)
Water 260 „
Alcohol, stronger 150 „

Dissolve the ferric chloride in the water, and add to it the alcohol. Add the solution, while cold, to a likewise cold solution of—

Sodium pyrophosphate, cryst	70 parts.
Water	1400 „

Set aside for one hour; then collect the precipitate on a filter, wash it with a moderate quantity of cold water, press it between bibulous paper, and dry it at a temperature not exceeding 30° C. (= 86° F.).

12. *Iron, Reduced.*

Iron, reduced by hydrogen.

13. *Iron Sulphate, Granular.*

Sulphuric acid, pure concent.	30 parts.
Water	150 „
Iron wire or filings	20 „

Add the acid to the water; then add the iron, which must be added in considerable excess. When the reaction has ceased, add—

Sulphuric acid, pure concent.	1 part.
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and then, under stirring—

Alcohol, stronger	an equal bulk.
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Let stand one hour; collect the precipitate on a strainer, wash it with alcohol, press and dry it, while exposing it to the air, and gently stirring on filtering paper as rapidly as possible. To be kept in well-closed bottles.

14. *Lithium Carbonate, Dry.*

Ammonium carbonate	5 parts.
Water, tepid	60 „
Water of ammonia, sp. gr. 960	6 „

Dissolve the ammonium carbonate in the water, and add the water of ammonia; then add, under stirring—

Lithium chloride, dry	4 parts,
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and heat to boiling. After twenty-four hours, collect the precipitate on a filter, wash it first with a little cold water, then with alcohol, until the washings cease to be or are only slightly clouded by silver nitrate. Finally, dry the precipitate on a water bath.

15. *Lithium Chloride, Solution.*

Lithium chloride, completely dried	1 part.
Water	9 parts.

Contains 10 per cent. anhydrous lithium chloride Sp. gr. 1057-1058.

16. *Lithium Phosphate, Dry.*

Lithium carbonate	4 parts.
Acetic acid, cont. 25 per cent. anhydride	21 „

Digest for several hours in a large flask: then add a filtered mixture of—

Water of ammonia, sp. gr. 960 . . .	55 parts.
Phosphoric acid, dilute, sp. gr. 1130 .	45 „
(or Phosphoric acid, dilute, sp. gr. 1120 .	49.6 „)
Water	200 „

Let stand one day; then collect precipitate on a filter, wash it with as small a quantity of water as possible, press it between filtering paper, and dry it at a temperature between 120°–150° C. (248°–302° F.).

17. *Magnesium Carbonate.*

Magnesium sulphate	3 parts.
Water	10 „

Dissolve and filter. Add to the filtrate contained in a flask.

Sodium bicarbonate, pure and in very fine powder	2 parts.
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Then expose the mixture in a warm place or on a water bath to a heat not exceeding 45° C. (= 113° F.) for about one-half hour, stir frequently, until the temperature has fallen to 40° C. (104° F.), and set it aside for three to four days at a temperature of 10°–15° C. (50°–59° F.), stirring occasionally; then collect the precipitate on a filter, wash it with cold water, press it strongly between filtering paper, or in a linen bag, break the cake into very small pieces, expose them between filtering paper for a few days to the air, rub them to powder, and preserve the powder in well-closed vessels.

18. *Magnesium Chloride, Solution.*

Hydrochloric acid, sp. gr. 1048 . . .	73 parts.
Magnesium carbonate, officinal . . .	10 „

To the magnesium carbonate, contained in a flask, gradually add the acid. (The magnesium salt must be present in excess.) Heat nearly to boiling, let cool, filter, and wash the filter with enough water to increase the bulk of the filtrate to 95 parts.

Contains 10 per cent anhydrous magnesium chloride. Sp. gr. 1085–1086.

19. *Magnesium Sulphate, Solution.*

Magnesium sulphate, cryst	41 parts.
Water	159 „
Or q. s. to make	200 „

Contains 10 per cent. anhydrous magnesium sulphate. Sp. gr. 1105–1106.

20. *Manganese Carbonate, Dry.*

Manganese sulphate, pure cryst. . . .	12 parts.
Water, recently boiled	120 „

Dissolve, filter, and cool to about 10° C. (= 50° F.); then add gradually a solution of—

Potassium bicarbonate	12 parts.
Water, recently boiled	120 „

Stir the mixture, let it stand for one day in a cold place, wash the precipitate with recently boiled but cold water, decant, collect the precipitate on a filter, wash it well, press it between bibulous paper, and dry it in a cold place over sulphuric acid. Preserve in a well-closed bottle. It should be white.

21. *Potassium Bromide, Crystallized.*22. *Potassium Carbonate, Solution.*

Potassium carbonate, pure dry	10 parts.
Water	81 „

Or q. s. to make a solution of sp. gr. 1092–1093.

Or, Potassium bicarbonate, cryst	10 parts.
Water	59 „

Sp. gr. 1092–1093.

Contains, in either case, 10 per cent. anhydrous potassium carbonate.

23. *Potassium Chloride, Dry.*

Potassium carbonate, dry	10 parts.
Water	20 „
Hydrochloric acid, sp. gr. 1123, about .	20 „

To the water and potassium carbonate, contained in a large flask, add the acid to exact neutralization. Let stand one day, and filter. Evaporate the filtrate until a perfectly dry salt remains.

24. *Potassium Chloride, Solution.*

Potassium chloride, dry	1 part.
Water	9 parts.

Dissolve and filter. Sp. gr. 1064–1065. Contains 10 per cent. potassium chloride.

25. *Potassium Iodide, Crystallized.*26. *Potassium Sulphate, Dry.*

Potassium sulphate, pure, powdered, and well dried.

27. *Sodium Arseniate, Solution.*

Arsenic acid (H_3AsO_4), dried at a moderate heat	23 parts.
Sodium carbonate, perfectly dry	32 „
Water	3000 „

Digest in a large flask until the acid is dissolved; then add—

Water, sufficient to make 4160 parts.

Contains 1 per cent. anhydrous sodium arseniate.

28. *Sodium Bromide, Solution.*

Sodium bromide, dry	1 part.
Water	9 parts.

Dissolve and filter. Sp. gr. 1091–1093.

Contains 10 per cent. dry sodium bromide.

29. *Sodium Carbonate, Solution.*

Sodium carbonate, dry	1 part.
Water	9 parts.

Or sufficient to make a solution of sp. gr. 1105.

Contains 10 per cent. anhydrous sodium carbonate.

30. *Sodium Chloride, Solution.*

Sodium chloride, dry	1 part.
Water	9 parts.

Dissolve and filter. Sp. gr. 1073–1074.

Contains 10 per cent. dry sodium chloride.

31. *Sodium Fluoride, Solution.*

Sodium fluoride, powdered	1 part.
Water, warm	99 parts.

Let stand a few days, occasionally shaking. Contains 1 per cent. of dry sodium fluoride.

Sodium fluoride, or any alkaline fluoride, may be prepared in the following manner. Spread a sheet of pure rubber (sheet-rubber) over a porcelain capsule, and depress the rubber to conform to the shape of the latter. Pour a rather dilute solution of the alkali into the rubber-covered dish, and gradually add pure hydrofluoric acid while stirring with a glass rod covered with a piece of pure rubber-tubing, until the alkali is perfectly neutralized. Some of the fluoride formed will probably separate of its own accord in form of a jelly; the remainder may be obtained by evaporating to a small bulk, straining, and drying the residue. The last mother-water should be thrown away.

32. *Sodium Iodide, Dry.*

Crystallized and powdered sodium iodide, dried on a water bath until it ceases to lose weight.

33. *Sodium Nitrate, Dry.*

Crystallized and powdered sodium nitrate, dried on a water bath until it ceases to lose weight.

34. *Sodium Phosphate, Solution.*

Sodium phosphate, offic.	. . .	61 parts.
Sodium carbonate, dry	. . .	9 "
Dissolve at a gentle heat in boiling distilled water	. . . . .	210 "
Or sufficient to make the weight up to		280 "

Sp. gr. at 30° C., 1.114–1.117. It should be filtered while warm. Contains 10 per cent. of dry basic sodium phosphate.

N.B.—This solution deposits crystals when cooled to 15° C.; it should therefore be brought to a temperature of 30° to 40° C. before using it.

35. *Sodium Silicate, Solution.*

Sodium carbonate, dry	. . .	40 parts.
Pure silica in fine powder	. . .	23 "

Mix intimately, press the mixture into a crucible, cover the latter, and expose it to a strong heat, until the mixture is melted, when it should be poured into an iron mortar, and after cooling be powdered. Keep in well-closed bottle. Take of this—

Sodium silicate	1 part.
Distilled water	5 parts.

Digest in a flask for one day, frequently shaking, then add—

Distilled water	4 parts.
---------------------------	----------

or sufficient to obtain altogether 10 parts. The solution must be preserved in a cork-stoppered vial, well closed.

Sp. gr. 1.105–1.107.

36. *Sodium Sulphate, Solution.*

Sodium sulphate, perfectly dry . . .	1 part.
Distilled water	9 „

Dissolve, filter, and preserve it at a medium temperature.

Contains 10 per cent. of dry sodium sulphate. Spec. gr. 1.092–1.093.

37. *Strontium Chloride, Solution.*

Strontium chloride, cryst . . .	20 parts.
Distilled water	98 „
Or sufficient to obtain altogether. .	100 „

Dissolve and filter. Sp. gr., 1.093–1.094.

Contains 10 per cent. of dry strontium chloride.

II. FORMULÆ FOR ARTIFICIAL MINERAL WATERS.

In the following formulæ the ingredients should be mixed in the order in which they are placed in groups. Each group is separated from the other by a line. For instance, in the first water mentioned (that of Bilin), the first six ingredients having been mixed, add to them the next two ingredients previously mixed together, then add the calcium sulphate, then the iron sulphate; and so in every case.

1. *Bilin. Joseph's Quelle.*

		To make 480 troy ounces.	
Potassium carbonate sol.	.	234	grains.
Sodium sulphate	„	198.6	„
„ carbonate	„	8030	„
„ chloride	„	829	„
Lithium chloride	„	38	„
Sodium phosphate	„	26	„
„ silicate	„	148	„

Magnesium sulphate	sol.	.	471	grains.
Alumin. and sod. sulphate	.	.	38·7	„
<hr/>				
Calcium sulphate, cryst.	.	.	159·4	„
Iron (proto-) sulph. gran. sol.	.	.	5·75	„
<hr/>				
Distilled water	.	.	220,170	„
Carbonic acid	.	.	3·5	volumes.

2. *Eger. Franzensbrunnen.*

			To make 480 troy ounces.	
Sodium sulphate	sol.	.	7256·4	grains.
„ chloride	„	.	1828	„
„ carbonate	„	.	2215	„
„ phosphate	„	.	12	„
„ silicate	„	.	289	„
<hr/>				
Magnesium chloride	sol.	.	228	„
Calcium chloride	„	.	604	„
Strontium chloride	„	.	1	„
Alum. and sod. sulph.	„	.	7	„
<hr/>				
Manganese carbonate	.	.	1·3	„
Lithium carbonate	.	.	1·11	„
Iron (proto-) sulph. gran.	.	.	17	„
<hr/>				
Distilled water	.	.	217,911	„
Carbonic acid	.	.	4	volumes.

Some are in the habit of adding besides,—

Sodium bromide	sol.	.	2·4	grains.
„ iodide	.	.	0·004	„
Ammonium carb. sol.	.	.	5·6	„

3. *Eger. Salzquelle.*

			To make 480 troy ounces.	
Sodium sulphate	sol.	.	6017	grains.
„ chloride	„	.	2116	„
„ carbonate	„	.	2087	„
„ phosphate	„	.	8·6	„
„ silicate	„	.	299	„
Lithium chloride	„	.	9·3	„
<hr/>				
Magnesium sulphate	sol.	.	342·6	„
Calcium chloride	„	.	476·3	„
Alum. and sod. sulphate	sol.	.	7·2	„

Manganese carbonate . . .	0.36	grains.
Iron (proto-) sulphate gran. . .	5	„
<hr/>		
Distilled water . . .	219,032	„
Carbonic acid . . .	4	volumes.

4. *Ems. Kesselbrunnen.*

		To make 10,000 grams.	
Sodium chloride	sol. .	64.62	grams.
„ sulphate	„ .	0.08	„
„ carbonate	„ .	174.4	„
„ phosphate	„ .	0.16	„
„ silicate	„ .	9.65	„
Potassium carbonate	„ .	0.31	„
„ sulphate, dry	„ .	0.472	„
<hr/>			
Calcium chloride	sol. .	18.2	„
Magnesium chloride	„ .	13.95	„
Barium chloride	„ .	0.024	„
Strontium chloride	„ .	0.022	„
Aluminium chloride	„ .	0.13	„
<hr/>			
Manganese carbonate . . .		0.004	„
Iron (proto-) sulphate gran. . .		0.062	„
<hr/>			
Distilled water . . .		9718	„
Carbonic acid . . .		3.5	volumes.

5. *Ems. Kränchen.*

		To make 10,000 grams.	
Sodium sulphate	sol. .	1.51	grams.
„ carbonate	„ .	160.767	„
„ phosphate	„ .	0.053	„
„ silicate	„ .	10	„
„ chloride	„ .	74	„
Potassium sulphate, dry	„ .	0.428	„
<hr/>			
Calcium chloride,	sol. .	17.3	„
Magnesium chloride	„ .	14.6	„
Barium chloride	„ .	0.006	„
Strontium chloride	„ .	0.0056	„
Alum. and sod. sulphate sol. .		0.08	„
<hr/>			
Manganese carbonate . . .		0.007	„
Iron (proto-) sulph. gran. . .		0.0383	„
<hr/>			
Distilled water . . .		9721	„
Carbonic acid . . .		2.5	volumes.

6. *Fachingen.*

		To make 480 troy ounces.	
			grains.
Sodium carbonate	sol.	6,130	
„ sulphate	„	11.5	„
„ phosphate	„	15.3	„
„ silicate	„	160	„
„ chloride	„	13.6	„
Lithium carbonate,	dry	0.018	„
„ phosphate,	„	0.006	„
<hr/>			
Calcium chloride	sol.	672.45	„
Magnesium chloride	„	524.4	„
Alum. and sod. sulph.	„	0.24	„
<hr/>			
Calcium fluoride, dry	.	0.08	„
Strontium carbonate, dry	.	0.024	„
<hr/>			
Iron (proto-) sulph., gran.	.	5.75	„
<hr/>			
Distilled water	.	222,867	„

7. *Fredrichshall (Bitterwasser).*

		To make 480 troy ounces.	
			grains.
Sodium sulphate	sol.	15,169	
„ chloride	„	15,456	„
„ bromide	„	294.3	„
„ carbonate	„	1,534.5	„
<hr/>			
Potassium sulphate, dry	.	45.7	„
Magnesium sulphate sol.	.	13571	„
Calcium chloride	„	2,569.5	„
Magnesium chloride	„	9,211	„
<hr/>			
Distilled water	.	172,560	„
Carbonic acid	.	3.5-4	volumes.

8. *Geilnau.*

		To make 480 troy ounces.	
			grains.
Potassium carbonate	sol.	32	
Sodium sulphate	„	19.5	„
„ phosphate	„	0.9	„
„ carbonate	„	1,775	„
„ chloride	„	83	„
Ammonium carbonate	„	2	„
Sodium silicate	„	116	„
<hr/>			
Barium chloride	sol.	0.36	„

Calcium carbonate . . .	78.45	grains.
Magnesium carbonate, cryst. .	60.24	"
<hr/>		
Iron (proto-) sulph. gran. .	6.45	"
Iron, reduced . . .	1.77	"
Manganese carbonate . .	0.78	"
<hr/>		
Distilled water . . .	227,224	"
Carbonic acid . . .	4	volumes.

9. *Heilbrunn. Adelheidsquelle.*

To make 480 troy ounces.		
Sodium bromide sol. .	110.4	grains.
" chloride " .	11,010	"
" carbonate " .	2,171	"
" silicate " .	90	"
" iodide, dry .	6.6	"
Potassium chloride sol. .	6	"
<hr/>		
Calcium chloride sol. .	194	"
Magnesium chloride " .	49	"
Aluminium chloride " .	111	"
<hr/>		
Iron (proto-) sulph. gran. .	2.82	"
Iron reduced . . .	0.48	"
<hr/>		
Distilled water . . .	216,648	"
Carbonic acid. . .	3.5	volumes.

10. *Kissingen. Pandur.*

To make 480 troy ounces.		
Sodium phosphate sol. .	13	grains.
" silicate " .	19	"
" chloride " .	9,757	"
" bromide " .	16.2	"
" carbonate " .	2,626.5	"
Potassium chloride " .	556	"
Lithium chloride " .	38.7	"
Ammonium carbonate " .	24.57	"
Sodium nitrate dry .	0.8	"
<hr/>		
Calcium chloride sol. .	3,180	"
Magnesium sulphate " .	1,925.4	"
" chloride " .	170.4	"
<hr/>		
Iron (proto-) sulph. gran. .	14.58	"
<hr/>		
Distilled water . . .	212,058	"
Carbonic acid . . .	4	volumes.

11. *Kissingen. Ragoczi.*

		To make 480 troy ounces.	
Sodium phosphate	sol.	13.5	grains.
„ silicate	„	60.4	„
„ chloride	„	10,411.5	„
„ bromide	„	19.2	„
„ carbonate	„	2,759.5	„
Potassium chloride	„	661	„
Lithium chloride	„	46	„
Ammonium carbonate	„	6	„
Sodium nitrate	dry	21.3	„
<hr/>			
Calcium chloride	sol.	3,600	„
Magnesium sulphate	„	2,220	„
„ chloride	„	56	„
<hr/>			
Iron (proto-) sulph.	gran.	17.43	„
<hr/>			
Distilled water	.	210,508	„
Carbonic acid	.	4	volumes.

12. *Homburg. Elizabethquelle.*

		To make 10 litres.	
Sodium sulphate	sol.	4.96	grams.
„ chloride	„	820.6	„
„ carbonate	„	183.2	„
„ silicate	„	8.26	„
<hr/>			
Magnesium chloride	sol.	129.78	„
Calcium chloride	„	259.86	„
<hr/>			
Iron (proto-) chloride (ferrous)	.	0.846	„
<hr/>			
Distilled water	.	8,592.5	„
Carbonic acid	.	4	volumes.

13. *Karlsbad.*

The various Karlsbad waters (*Aquæ Carolinenses*) differ from each other but little, except in the amount of carbonic acid, and in temperature. The difference as to the latter is:—

Theresienbrunnen	.	.	.	50° C.
Schlossbrunnen	.	.	.	50° C.
Mühlbrunnen.	.	.	.	52.5° C.
Neubrunnen	.	.	.	53° C.
Sprudel	.	.	.	73° C.

The following formula yields a water of *double* the strength of the natural. For use it should be diluted with an equal volume of fresh or carbonic acid water :—

		To make 10 litres.	
Sodium carbonate	sol. . .	349·14	grams.
„ sulphate	„ . .	501·14	„
„ chloride	„ . .	84·44	„
„ phosphate	„ . .	0·10	„
„ silicate	„ . .	30·12	„
Potassium sulphate, dry	. . .	1·87	„
Sodium fluoride	„ . .	0·07	„
„ bromide	„ . .	0·024	„
„ iodide	„ . .	0·0093	„
<hr/>			
Calcium chloride	sol. . .	69·26	„
Magnesium chloride	„ . .	40·34	„
Strontium chloride	„ . .	0·20	„
Aluminium chloride	„ . .	0·06	„
<hr/>			
Manganese sulphate, dry	. . .	0·02	„
Iron (proto-) sulph., gran.	. . .	0·17	„
Lithium carbonate	. . .	0·05	„
<hr/>			
Distilled water	. . .	8,923	„
Carbonic acid	. . .	3·3·5	volumes.

14. *Kreuznach. Elizabethquelle.*

		To make 480 troy ounces.	
Potassium chloride	sol. . .	187	grains.
Lithium chloride	„ . .	184	„
Sodium silicate	„ . .	79	„
„ carbonate	„ . .	511·5	„
„ chloride	„ . .	21,170	„
„ bromide	„ . .	93	„
„ iodide, dry	„ . .	1·12	„
<hr/>			
Magnesium chloride,	sol. . .	1,304	„
Calcium chloride	„ . .	4,579	„
<hr/>			
Distilled water	. . .	202,292	„
Carbonic acid	. . .	3·5	volumes.

15. *Püllna. Bitterwasser.*

		To make 10 litres.	
Sodium sulphate	sol. . .	1,458·24	grams.
„ carbonate	„ . .	117·18	„
Potassium sulphate, dry	. . .	6·25	„

Magnesium sulphate	sol. . .	1,373·60	grains.
„ chloride	„ . .	183·58	„
Calcium chloride	„ . .	39·06	„
<hr/>			
Distilled water	. . . .	6,822·10	„
Carbonic acid	. . . .	2·5	volumes.

16. *Spaa. Pouhon.*

To make 480 troy ounces.			
Sodium carbonate	sol. . .	225·5	grains.
„ chloride	„ . .	91	„
„ phosphate	„ . .	7·35	„
Potassium carbonate	„ . .	18·8	„
<hr/>			
Alum. and sod. sulph.	sol. . .	4·7	„
Calcium chloride	„ . .	4·17	„
<hr/>			
Calcium carbonate	. . . .	29·5	„
Magnesium carbonate	. . . .	55·4	„
<hr/>			
Iron (proto-) sulph., gran.	. . . .	5	„
Iron, reduced	. . . .	8·8	„
<hr/>			
Distilled water	. . . .	229,954	„
Carbonic acid	. . . .	4	volumes.

17. *Vichy. Source des Célestins.*

To make 10 litres.			
Sodium carbonate	sol. . .	373·34	grams.
„ phosphate	„ . .	9·10	„
„ chloride	„ . .	9·26	„
„ silicate	„ . .	12 04	„
Potassium carbonate	„ . .	21·74	„
<hr/>			
Magnesium sulphate	sol. . .	24·28	„
„ chloride	„ . .	5·10	„
Strontium chloride	„ . .	0·42	„
Calcium chloride	„ . .	35·60	„
<hr/>			
Iron (proto-) sulph., gran.	. . . .	0·07	„
Sodium arseniate, dry	. . . .	0·02	„
<hr/>			
Distilled water	. . . .	9,509	„
Carbonic acid	. . . .	3·5	volumes.

18. *Vichy. Source de la Grande-Grille. Temp., 43° C.*

		To make 10 litres.	
Sodium carbonate	sol. . .	354·83	grams.
„ phosphate	„ . .	13·0	„
„ arseniate ($\frac{1}{100}$ %) sol.	„ . .	2·0	„
„ chloride	sol. . .	11·8	„
„ silicate	„ . .	14·23	„
Potassium carbonate	„ . .	24·24	„
<hr/>			
Magnesium sulphate	sol. . .	24·3	„
„ chloride	„ . .	5·16	„
Strontium chloride	„ . .	0·25	„
Calcium chloride	„ . .	33·4	„
<hr/>			
Iron (proto-) sulph., gran.	„ . .	0·07	„
<hr/>			
Distilled water	. . . .	9,516·7	„
Carbonic acid	. . . .	4	volumes.

It will be found advantageous to prepare this of double the above strength; that is, taking all the ingredients except the water in double the quantity—leaving, however, the sodium silicate out—and using 9,037·2 grams of water. For use, it is to be diluted with an equal volume of warm water.

19. *Wiesbaden. Kochbrunnen.*

		To make 10 litres.	
Sodium chloride	sol. . .	632·49	grams.
„ phosphate	„ . .	0·04	„
„ silicate	„ . .	12·10	„
„ carbonate	„ . .	36·	„
Potassium chloride	„ . .	14·30	„
Ammonium chloride, dry	„ . .	0·17	„
Potassium bromide	„ . .	0·04	„
<hr/>			
Calcium sulphate, cryst.	„ . .	1·05	„
<hr/>			
Calcium chloride	sol. . .	94·14	„
Magnesium chloride	„ . .	21·74	„
„ sulphate	„ . .	0·08	„
Aluminium chloride	„ . .	0·046	„
<hr/>			
Lithium carbonate, dry	„ . .	0·002	„
Iron (proto-) sulph., gran.	„ . .	0·134	„
Sodium arseniate, dry	„ . .	0·001	„
<hr/>			
Distilled water	. . . .	9,187·7	„
Carbonic acid	. . . .	3·5	volumes.

20. *Wildungen. Stadtbrunnen.*

		To make 480 troy ounces.	
Sodium carbonate	sol. . .	222·3	grains.
„ chloride	„ . .	21·3	„
<hr/>			
Magnesium sulphate	sol. . .	90·6	„
Calcium carbonate,	dry . .	113·28	„
Magnesium carbonate,	cryst. .	125·25	„
Alum. and sod. sulph.,	sol. . .	12·	„
<hr/>			
Iron (proto-) sulph.,	gran. .	10·	„
Manganese carbonate	. . .	1·57	„
<hr/>			
Distilled water	. . . .	229,804	„
Carbonic acid	. . . .	4	volumes.

TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
SIXTEENTH ANNUAL MEETING
AT
SHEFFIELD,
1879.

EDITED BY
PROFESSOR ATTFIELD.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.
2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.
3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.
4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.
5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.
6. At each Conference, it shall be determined at what place and time to hold that of the next year.
7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.
8. The Executive Committee shall present a report of proceedings annually.
9. These rules shall not be altered except at an annual meeting of the members.
10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

* * * Authors are specially requested to send the titles of their Papers to either of the General Secretaries two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

Name)

(Address)

as a Member of the British Pharmaceutical Conference.

Member.

Date

This or any similar form must be filled up legibly, and forwarded to one of the Honorary General Secretaries, Prof. ATTFIELD, 17, Bloomsbury Square, W.C., or F. BADEN BENDER, F.C.S., 7, Exchange Street, Manchester, either of whom, or any other officer or member, will duly sign the paper.

Pupils and Assistants, as well as Principals are invited to become members.

HONORARY MEMBERS.

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Members will please report any inaccuracies in these lists to

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 Bragg, Mr. W. B., Market Harborough.
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 Brown, Mr. D., 93, Abbey Hill, Edinburgh.
 Brown, Mr. E., 66, Woodhouse Lane, Leeds.
 Brown, Mr. E. W., Thrapstone, Northamptonshire.
 Brown, Mr. G., Sandown, Isle of Wight.
 Brown, Mr. G. B., 35, Church Street, Sheffield.
 Brown, Mr. H., 40, Aldersgate Street, E.C.
 Brown, Mr. J., 187, Mill Street, Great Ancoats, Manchester.
 Brown, Mr. J. F., 4., Market Square, Dover.
 Brown, Mr. R. D., Loose Hill, Loose, Maidstone.
 Brown, Mr. W. B., 100, Fishergate, Preston, Lancs.
 Brown, Mr. W. S., 113, Market Street, Manchester.
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 Clarke, Mr. J., 20, George Street, Croydon.
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 Clayton, Mr. F. C., 18, Wheelleys Lane, Birmingham.
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 Cooper, Mr. H. G., 24, High Street, Grantham.
 Cooper, Mr. J. N., Mr. Warner, 1 Mall, Clifton, Bristol.
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 Cooper, Mr. T., 30, Walmgate, York.
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Watts, Mr. C. C., Cliftonville, Brighton.
Watts, Mr. H., 14, Hamond Street, Chatham.
Watts, J., D.Sc., F.I.C., F.C.S., 57, Baker Street, W.
Watts, Mr. J., Dudley Hill, Bradford, Yorks.
Watts, Mr. L. R., 175, Pond Street, Sheffield.
Watts, Mr. W., 10, Bedford Terrace, Kensington, W.
Watts, Mr. W. M., 32, Lower Whitecross Street, E.C.
Watts, W. M., D.Sc., F.C.S., Giggleswick School, Settle, Yorks.
Waugh, Mr. J., 178, Chapel Street, Salford.
Wealthall, Mr. A., 156, Great Jackson Street, Hulme, Manchester.
Weaver, Mr. T., The Dispensary, Paradise Street, Birmingham.
Webb, Mr. E. A., Salisbury House, Turnham Green, W.
Webber, Mr. C. F., Market Place, Sidmouth, Devon.
Webster, Mr. E. P., Dispensary Lane, Newcastle-on-Tyne.
Webster, Mr. S. M., 33, Bridge Street, Warrington.
Welberry, Mr. G., Bridge Gate, East Retford.
Welch, Mr. C., 161, King's Road, Reading.
Welch, Mr. T., 29, Mosley Street, Newcastle-on-Tyne.
Wells, Mr. T., 2, Shirland Road, Maida Vale, W.
Wells, Mr. W. F., junr., 52, Upper Sackville Street, Dublin.
Welton, Mr. H., 5, Bishop Street, Coventry.
West, Mr. E. R., 17, Strand, Dawlish.
West, Mr. T., 61, Chester Road, Stretford, Manchester.
West, Mr. W., 15, Horton Lane, Bradford.
Westlake, Mr. J., 4, High Street, Sutton.
Weston, Mr. C., 4, Regent's Parade, Mill Street, Ventnor, Isle of Wight.
Weston, Mr. G., South Street, Sleaford, Lincs.
Weston, Mr. S. J., 151, Westbourne Terrace, W.
Westrup, Mr. J. B., 76, Kensington Park Road, W.
Wheeldon, Mr. J., 241, Stockport Road, Manchester.
Wheeler, Mr. J. W., 1, Jermyn Street, St. James's, S.W.
Whewell, G., F.I.C., F.C.S., Exchange Chambers, Blackburn.
While, Mr. W. J., 123, London Street, Reading.
Whincup, Mr. W., 404, Essex Road, Islington, N.
White, Mr. E. A., Mayfield, Sussex.
White, Mr. F., London Road, Nottingham.
White, Mr. G. H., 39, Commercial St., Mountain Ash, Glamorganshire.
White, Mr. J. W., 52, Royal York Crescent, Clifton, Bristol.
White, Mr. W., 15, Westgate, Bradford, Yorks.
Whitfield, Mr. H., 45, High Street, Worcester.
Whitfield, J., F.C.S., 113, Westborough, Scarborough.
Whitford, Mr. J. G. P., 20, Mardyke Parade, Cork.
Whitrow, Mr. B., 15, St. James's Terrace, Winchester.
Whittaker, Mr. E., 32, Regent Road, Salford, Lancs.
Whittle, Mr. S., Leigh, Lancashire.
Whittles, Mr. H., 44, Wheeler Street, Lozells, Birmingham.
Whysall, Mr. W., Grantham.

- Whyte, Mr. W., 110, Trongate, Glasgow.
 Wiggins, Mr. H., 236, Southwark Park Road, Bermondsey, S.E.
 Wild, Mr. F., 299, Oxford Street, Manchester.
 Wild, Mr. J., Clarendon Place, Hyde, Cheshire.
 Wilday, Mr. G. E., Address unknown.
 Wildsmith, Mr. E., 94, West Street, Leeds.
 Wiles, Mr. E., 1, Mitchell Street, Sheffield.
 Wilford, Mr. J., 7, Lower Parliament Street, Nottingham.
 Wilkes, Mr. J. S., 236, Broad Street, Birmingham.
 Wilkinson, Mr. B. J., 1, Middleton Road, Kingsland, E.
 Wilkinson, Mr. G., 267, Waterloo Road, Manchester.
 Wilkinson, Mr. R., High Street, Kippax, near Leeds.
 Wilkinson, Mr. T., 270, Regent Street, W.
 Wilkinson, Mr. W., 114, Lambeth Walk, S.E.
 Wilkinson, Mr. W., Hope Street, Crook, Durham.
 Wilkinson, Mr. W., 263, Cheetham Hill, Manchester.
 Wilkinson-Newsholme, Mr. G. T., 74, Market Place, Sheffield.
 Wilks, Mr. M., 70, Market Place, Burnley, Lancs.
 Will, Mr. W. W., 30, Lower Hall Street, Montrose, N.B.
 Willan, Mr. R., 5, Market Street, Ulverston.
 Willan, Mr. W., 3, Friargate, Preston, Lancs.
 Williams, Mr. C. J., 4, St. John's, Warwick.
 Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
 Williams, Mr. E., Milkwood Road, Brixton.
 Williams, Mr. E., 10, Wrexham Street, Mold.
 Williams, Mr. G. L., Burnham, Somerset.
 Williams, Mr. H. W., 1, High Street, Barmouth.
 Williams, J., F.I.C., F.C.S., 16, Cross Street, Hatton Garden,
 Williams, Mr. J., 72, Camp Hill, Birmingham.
 Williams, Mr. J., Victoria Road, Aldershot.
 Williams, Mr. J. D., Turret House, Bodmin, Cornwall.
 Williams, Mr. J. J., 14, Clifton Villas, Maida Vale, W.
 Williams, Mr. J. T., Nelson Street, Swansea.
 Williams, Mr. J. V., St. Alban's House, Weymouth.
 Williams, Mr. R., St. Clears, Carmarthenshire.
 Williams, Mr. R., 324, Coldharbour Lane, Brixton, S.W.
 Williams, Mr. T., 11, Bute Street, Cardiff.
 Williams, Mr. T. N., 13, High Street, Aberdare.
 Williams, Mr. W., 265, Crown Street, Liverpool.
 Williams, Mr. W., Llanfyllin.
 Williams, Mr. W. D., High Street, Hampstead, N.W.
 Williams, Mr. W. H., 13, Upper Baker Street, W.
 Williams, Mr. W. H., Hayle, Cornwall.
 Williams, Mr. W. J., 137, Cannon Street, E.C.
 Willis, Mr. B. W., 59, High Street, Evesham.
 Willis, Mr. C., 55, High Street, King's Lynn.
 Willmott, Mr. W., King's College Hospital, W.C.
 Willmott, Mr. W., The Brewery, Sheffield.
 Wills, Mr. G. S. V., Gladstone House, St. George's Road, Southwark.
 Willsheer, Mr. S. H., High Street, Tenterden.
 Wilson, Mr. C. F., 23, Liverpool Road, Stoke-on-Trent.
 Wilson, Mr. G., 40, Cathcart Street, Greenock, N.B.
 Wilson, Mr. H., 19, Rusholme Road, Manchester.
 Wilson, Mr. J., General Infirmary, Derby.
 Wilson, Mr. J., Penrith, Cumberland.
 Wilson, Mr. J., 50, Charlotte Street, Leith, N.B.
 Wilson, Mr. J. H., 5, West Park, Harrogate.
 Wilson, Mr. J. N., 16, Loven Street, Edinburgh.
 Wilson, Mr. J. P., 115, London Street, Reading.
 Wilson, Mr. T., Stowmarket.

- Wilson, Mr. W., 21, High Street, Hanley, Staffordshire.
Wing, Mr. G. N., Melton Mowbray.
Wing, Mr. Lewis, Chislehurst, W., Kent.
Wink, Mr. J. A., 5, Barge Yard, Bucklersbury, E.C.
Witherington, Mr. S. H., 410, Wandsworth Road, Clapham, S.W.
Wood, Mr. A., New Brentford.
Wood, Mr. A., 6, London Road, Sheffield.
Wood, Mr. E. B., 46, Holloway Head, Birmingham.
Wood, Mr. F., 18, Clarence Street, Cheltenham.
Wood, Mr. R., 25, Mill Street, Macclesfield.
Wood, Mr. W., Pontypool.
Wood, Mr. W. A., 81, Church Street, Hunslet, Leeds.
Woodcock, Mr. J., 15, Southgates, Leicester.
Woodcock, Mr. P. D., Calvert Street, Norwich.
Woodcock, R. C., F.I.C., F.C.S., 23, Abingdon Street, Westminster.
Woodhead, Mr. J. T., 29, Paradise Street, Liverpool.
Woodhead, W. H., M.D., 58, Grosvenor Street, Manchester.
Woodland, Mr. J., 52, Alexandra Road, Cambridge Junc., Kilburn, N.W.
Woodland, Mr. W. F., Chard, Somersetshire.
Woodward, Mr. J. L., Bridgewater.
Woolcott, Mr. C., 49, Upper Parade, Leamington.
Woolley, Mr. G. S., 69, Market Street, Manchester.
Woolley, Mr. Hermann, 69, Market Street, Manchester.
Woolrich, Mr. C. B., Uttoxeter, Staffs.
Wooster, Mr. J. R., 4, Broadway, Turnham Green, W.
Wootton, Mr. A. C., Grove House, Shacklewell, E.
Wootton, Mr. P., George Street, Luton, Beds.
Worfolk, Mr. F., 57, Bridge Street, Bolton.
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Worth, Mr. E., Town Hall, Bournemouth.
Worthington, Mr. W., 42, Kennington Road, Southport.
Wright, Mr. A., 109, High Street, Lowestoft.
Wright, A., A.K.C., 441, Strand, W.C.
Wright, C. R. A., D.Sc., F.I.C., F.C.S., St. Mary's Hospital, W.
Wright, Mr. G., 102, High Street, Burton-on-Trent.
Wright, Mr. G. H., 103, Boro' High Street, S.E.
Wright, Mr. J., 165, King Street, Yarmouth.
Wright, Mr. W. F., 30, Regent Street, Leamington.
Wright, Mr. W. O., 55, Great Scotland Road, Liverpool.
Wright, Mr. W. R., High Street, Chatteris.
Wrighton, Mr. T. H. G., Market Place, Cannock.
Wyatt, Mr. H., 20, Derby Road, Bootle, Liverpool.
Wyborn, Mr. J. M., 59, Moorgate Street, E.C.
Wyke, Mr. J., 51, Cross Street, Abergavenny.
Wylde, Mr. S., 86, Louisa Road, Breckfield Road, Liverpool.
Wyles, Mr. W., 338, Oxford Street, W.
Wyley, Mr. J., Coventry.
Wyley, Mr. W. F., Hertford Street, Coventry.
Wyllie, Mr. D. N., 1, South College Street, Edinburgh.
Wyllie, Mr. T., Port Glasgow.
Wyllie, Mr. A., 287, High Street, Glasgow.
Wyman, Mr. J., Charles Street, Farringdon Road, E.C.
Wynne, Mr. E. P., 3, Pier Street, Aberystwith.
- Yates, Mr. D., 32, Darwen Street, Blackburn.
Yates, Mr. F., 64, Park Street, Southwark, S.E.
Yeomans, Mr. J., Sydney Street, Cambridge.
Yewdall, Mr. E., 56, Wade Lane, Leeds.
Young, Mr. A., Address unknown.
Young, C., F.R.C.S., Edin., 50, Ann Street, Dundee.

Young, Mr. D., 30, West Market Place, Cirencester.
Young, Mr. J., 16, Gallowtree Gate, Leicester.
Young, Mr. J., 20, High Street, Newport, Mon.
Young, Mr. J., Folds Road, Bolton.
Young, J. R., F.C.S., Sankey Street, Warrington.
Young, Mr. J. R., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.
Young, Mr. W., 8, Neeld Terrace, Harrow Road, W.

NOTICE.

Members will please report any inaccuracies in these lists to

PROFESSOR ATTFIELD, *Hon. Gen. Sec.*,

17, *Bloomsbury Square,*

London, W.C.

BRITISH PHARMACEUTICAL CONFERENCE.

1879-80.

ALPHABETICAL LIST OF TOWNS AT WHICH MEMBERS RESIDE.

*The names to which an asterisk is attached are those of Local Secretaries.
For Alphabetical List of Names, see page 318.*

Aberayron. Jones, J. P.	Accrington. Astin, E. Cooper, M. (Church.)	Arbroath. Burn, D. H. Ogilvie, W. O. Reid, W.
Aberdare. Evans, T. W. Jones, D. W. Richards, J. Sims, W. Thomas, W. J. Williams, T. N.	Airdrie, N.B. Harvie, J.	Ardrossan. Gemmell, H.
Aberdeen. Davidson, C. Eddie, W. Glegg, J. Gordon, J. Gordon, W. McGregor, G. (Ellon.) Paterson, S. Rattray, W. Strachan, A.	Aldershot. Fairbank, F. W. Williams, J.	Armagh. Hillock, J.
Aberdeen (Old). Ross, R.	Alfreton. Robinson, J. S.	Ashby-de-la-Zouch. Cooper, A. Johnson, S. E. Matthews, C.
Aberford. Rishworth, H.	Alnwick. Newbigin, J. L. Simpson, G.	Ashford, Kent. Ingall, J. Stedman, L.
Abergavenny. Wyke, J.	Alresford. Richardson, T. H.	Ashton-on-Ribble. Fisher, J.
Abergele. Lloyd, E., jun.	Alston. Thompson, G.	Ashton-under-Lyne. Belfield, W. *Bostock, W. Hirst, J. Thatcher, T.
Aberystwith. Davies, D. J. Davies, J. H. Ellis, R. Vaughan, W. G. Wynne, E. F.	Altrincham. Hughes, E.	Atherstone. Orme, W.
	Alva (Stirlingshire). McNicol, J.	Athy. Conolly, S. J.
	Ambleside. Bell, T. Bell, T.	Axminster. Gunn, F. J.
	Anerley. Bullock, F.	Aylesbury. Clift, H. Turner, J.
	Appleby. Longrigg, J.	

- Ayr.**
Burns, W.
- Bacup.**
Dyson, A.
Sutcliffe, C. H.
- Baldock.**
Bally, E. F.
- Ballycroy.**
Croly, T. H.
- Ballymena**
Beatty, J.
- Bampton.**
Gare, W.
- Banbury.**
Simpson, T.
(Bloxham.)
- Banchory.**
Lunan, A.
- Bangor.**
Roberts, M.
- Barking, Essex.**
Fitt, F. E.
- Barmouth.**
Williams, H.
- Barnard Castle.**
Gardner, W.
Gibson, B. W.
- Barnet.**
Huggins, G. T.
- Barnsley.**
Horner, E.
Iberson, J.
- Barnstaple.**
Goss, S.
Symons, W.
Tremeer, J. J.
- Barrow-on-Hum-
ber.**
Hamilton, W
- Barton-on-Hum-
ber.**
Tomlinson, H. J.
- Barton-under-
Needwood.**
Cole, J.
- Basingstoke.**
Sapp, A.
- Bath.**
Appleby, E. J.
Barnitt, F.
Brooke, C.
Caswell, H. W.
Commans, R. D.
Ekin, C.
Hillier, H.
Hughes, J. E.
Humby, L. W.
Marsh, J. H.
Merrikin, J. B.
Toone, J. V.
- Bathgate.**
Frieland, J.
- Battle.**
Brailsford, H.
- Beaully.**
Mitchell, A.
- Beccles.**
Count, S.
- Beckenham, Kent.**
Day, T. S.
Griffin, T.
- Bedale.**
Bellamy, R.
Hawkin, J.
- Bedford.**
Cuthbert, J. M.
Norman J. S.
- Beeston.**
Faull, E.
- Belfast.**
Ball, T.
Clotworthy, S.
Coulter, J.
Dobbin, W.
Gosgar, J. J.
Haslett, J. H.
Hodges, J. F.
Hodges, J. F. W.
McMullen, F.
Payne, J. C. C.
Pring, R. W.
- Bellingham.**
Stainthorpe, W. W.
- Belper, Derby.**
Burkinshaw, W. T.
- Berriew.**
Tilsley, J.
- Bervie.**
Robertson, D.
- Berwick-on-
Tweed.**
Carr, W. G.
Carr, W. P.
- Betley, Staffs.**
Place, F. W.
- Beverley.**
Hobson, C.
James, K.
Marshall, T.
- Bicester.**
Sandiland, R. B.
- Biggleswade.**
Maxwell, G. N.
- Bilston.**
Gray, C.
Kearnes, R. H.
Lloyd, G. H.
- Bingley, Yorks.**
Gill, G.
Perfect, R.
Skirrow, W. E.
- Birkenhead.**
Bennett, H.
Cooke, W. K.
*Dutton, J.
Fawcett, J.
Foulkes, W. J.
Mullock, R.
Nicholson, H.
Shaw, R. H.
Stewart, J.
- Birmingham.**
Arblaster, C. J.
Atkins, W. S.
Austin, W.
Barclay, T.
Bates, J.
Clayton, F. C.
Dewson, S.
Foster, J. A.
Grady, F.
Griffin, J. T.
Haydon, W. F.
Holdsworth, T. W.
Jardine, W. D.
Jones, H. W.

- Kimberley, W.
 Leah, G. R.
 Miller, W. C.
 Oxborrow, E.
 Palethorpe, S.
 Perry, G. E.
 Robinson, A. E.
 Snape, E.
 Southall, A.
 Southall, W.
 Tait, L.
 Thonger, G.
 Tucker, H. S.
 Weaver, T.
 Whittles, H.
 Wilkes, J. S.
 Williams, J.
 Wood, E. B.
- Bishop Auckland.**
 Carruthers, G.
 Dobinson, T.
 Harburn, R. H.
 *Leigh, J. J.
 Thorburn, H.
- Bishop's Castle.**
 Owen, J.
- Bishop Stortford.**
 Hardy, J.
 Speechly, G.
- Blackburn.**
 Bickerdike, W. E.
 Booth, J.
 Clayton, J. W.
 Critchley, T.
 *Farnworth, W.
 Moulden, W.
 Whewell, G.
 Yates, D.
- Blackpool.**
 Curtis, T.
 Harrison, J.
 Jackson, J.
- Blairgowrie.**
 Crerar, J.
 Grant, W.
- Blanford.**
 Bird, M. M.
- Blaydon-on-Tyne.**
 Parker, H.
 Miller, W.
- Blyth.**
 Keudall, J. L.
- Bodmin.**
 Williams, J. D.
- Bognor.**
 Long, A. T.
- Bolton, Lancashire.**
 Blain, W.
 Bowker, W.
 Cartwright, W. A.
 Challinor, S. M.
 Dutton, F.
 Evans, D. O.
 (Farnworth.)
 Forbes, T. W.
 Harrison, R.
 (Farnworth.)
 Hart, J.
 Hart, W.
 Holmes, T.
 Holstead, T.
 Holt, A.
 Mason, W. B.
 Mather, J.
 Morris, T.
 (Farnworth.)
 Moscrop, T.
 Pownall, T. R.
 Taylor, J.
 Watkinson, J. W.
 (Farnworth.)
 Worfolk, F.
 Young, J.
- Borrowstowness,**
N.B.
 Hughes, F. R.
- Boston.**
 Clayton, D. T.
 Fowler, W. R.
 *Marshall, R.
 Mells, H. (Kirton.)
 Pilley, S.
 Pilcher, W. J.
 Southwell, C. H.
- Boston Spa.**
 Gill, H.
 Rogerson, M.
- Bourne.**
 *Mills, R. M.
- Bournemouth.**
 Shemmonds, J.
 Trim, E.
 Worth, E.
- Brackley.**
 tt, H.
- Bradford-on-Avon.**
 Saunders, T. P.
- Bradford, York-shire.**
 Appleyard, R.
 Bailey, J. T.
 Beanland, S.
 Bell, F.
 Butterworth, A.
 Cockshott, W.
 Drake, W. (Wyke.)
 Faull, J.
 Handforth, E.
 Harrison, T.
 Henderson, C.
 Jackson, J.
 King, W.
 Lister, S.
 Metcalfe, A. A.
 Newsholme, W.
 Parker, S.
 Parker, W.
 *Parkinson, R.
 Pullan, T.
 Rimmington, F. M.
 Savage, J. L.
 Sharp, J.
 Silson, R. W.
 Stead, T.
 Swaine, J.
 Thornton, H.
 Walker, J.
 Watts, J.
 West, W.
 White, W.
- Braintree.**
 Downing, J. G.
- Bray.**
 Vance, J. N.
 Vance, W. N.
 Doran, A. E.
- Brenchley, Kent.**
 Keene, J.
- Brentwood, Essex.**
 Guest, E. P.
- Bridge, Kent.**
 Thomas, J.
- Bridge of Allan,**
N.B.
 Farie, G.
- Bridgewater.**
 Woodward, J. L.

- Bridlington Quay.**
Dickins, J.
- Bridport.**
Beach, J.
Tucker, C.
- Brierley Hill.**
Geary, E.
- Brigg.**
Nicholson, W. O.
- Brighton.**
Barton, H.
Billing, T.
Bullen, T.
Cornish, W.
Cox, A. H.
Dinnis, J.
Edwards, J.
Else, W.
Ettles, J.
Foster, F.
Gibson, W. H.
Glaisyer, T.
Guy, F.
Gwatkin, J. T.
Haffenden, T.
Harris, E. R.
Histed, E.
Kent, G. F.
Leigh, M.
Long, H.
Padwick, J.
Robson, T.
*Savage, W. D.
Savage, W. W.
Smith, W. H.
Sprackett, W.
Vizer, E. B.
Warneford, F.
Watts, C. C.
- Brill.**
Holmes, F. G.
- Bristol.**
Ackerman, T.
Allen, B.
Berry, W.
Boorne, C.
Boucher, T.
Bowden, T. L.
Bush, T. (Paulton.)
Cuff, R. C.
Dudden, R. M.
England, W.
Fardon, H.
Freestone, T. M.
Gare, J.
- Gregory, W.
Hatch, R. M.
Jeffery, H.
Jennings, T. H.
Lockyer, W. J.
Long, J. T.
Matthews, H.
Newman, R.
Pitman, J.
Plumley, J. G.
Presley, E.
Rich, T.
Roper, J. A.
Samson, E.
Saunders, T. C.
Sprackett, G.
*Stoddart, W. W.
Stoddart, W. W.
Stroud, J.
Thomas, J. D. D.
Townsend, C.
Tucker, R. L. (Red-
land.)
Wright, C. W.
- Briton Ferry.**
Olive, W. T.
- Bromsgrove.**
Haines, J. J.
Taylor, W. G.
- Bromwich, West.**
*Burch, W.
Green, J.
Holliday, T.
Roberts, G.
- Broseley.**
Stevens, J.
- Brynmawr.**
Evans, A. E.
Jones, A. M.
- Buckie.**
Bremner, J.
- Buckingham.**
Kingerlee, G.
- Builth.**
Thomas, W.
- Burnham, Essex.**
Ellis, W.
- Burnham, Somers-**
set.
Williams, G. L.
- Burnley.**
Ashworth, T.
Cowgill, B. H.
Hay, D. (Nelson.)
Hitehin, R.
*Thomas, R.
Wilks, M.
- Burry Port.**
Thomas, T. R.
- Burslem.**
*Blackshaw, T.
Cotton, J. M.
Guest, G. C.
Oldham, W.
- Burton-on-Trent.**
Buscall, H. J.
Brierley, J.
Ottey, T.
Wright, G.
- Bury, Lancashire.**
Pennington, T.
- Bury St. Edmunds.**
Hardwicke, E. J.
- Bushey Heath.**
Short, E. C.
- Buxton.**
Ball, E.
Barnett, A.
Sykes, E. J.
Thresh, J. C.
- Cambridge.**
Church, H. J.
Crampton, J.
*Deck, A.
Knights, J. W.
Muir, M. M. P.
Yeomans, J.
- Campbeltown.**
Barton, A.
- Cannock.**
Wrighton, T. H. G.
- Canterbury.**
Amos, D.
Gardner, A. W.
*Harvey, S.
Mount, W.

Cardiff.

Collier, J. A.
John, W. D.
Jones, J. T.
Joy, F. W.
Proctor, R. (Penarth.)
Reynolds, T. (Caer-
philly.)
Williams, T.

Carlisle.

Fisher, J. J.
Foster, J.
Graham, J.
Hallaway, J.
Pattinson, J. S.
Richardson, T. J.
Robson, J.
Sawyer, H.
*Thompson, A.
Todd, J.
Walker, J. D.

Carmarthen.

Rees, D.

Carnforth.

Watson, W. H.

Carnoustie.

Nicol, W.

Carshalton.

Thornley, C.

Castlebar.

Devers, H. J.

Castleford.

McHugh, H. S.

Castletown I. M.

Kerwode, R. H.

Caterham Valley.

Edwards, H.

Cerrig-y-Druidion.

Williams, E.

Chapeltown.

Gibson, J.

Chard.

Churchouse, W. J. F.
Woodland, W. F.

Chatham.

Lamb, T. C.
Rossiter, J.
Watts, H.

Chatteris.

Wright, W. R.

Cheddar.

Bryne, J.

Chelmsford.

Baker, C. P.

Cheltenham.

Balcomb, J.
*Barron, W.
Beetham, M.
Fletcher, J.
Forth, W.
Horsley, J.
Jeffrey, T. A.
Kite, W. T.
Passmore, C. F.
Smith, N.
Toone, J. A.
Wood, F.

Chertsey.

Boyce, G.

Chester.

Baxter, G.
Grindley, W.
Hodges, W.
Marcham, J.
Mills, J.
*Shepherd, T.

Chesterfield.

Cantrell, W.
Greaves, A.

Chester-le-Street.

Greenwell, R. H.
Longbotham, J.
*Robinson, Joseph
(Stanley.)

Chippenham.

Coles, J. C.

Chislehurst.

Beaumont, C. F. J. B.
Wing, L.

Chorley.

Bradshaw, J.
(Adlington.)

Chudleigh.

Cleave, W.

Church Stretton,
Salop.

Phillips, J.

Cirencester.

Church, A. H.
Smith, C. S.
Young, D.

Clayton-le-Moors.

Johnson, M.

Cleator Moor.

Turner, J. K.

Cleethorpes.

Peck, F. A.

Clifton, Bristol.

Barker, C. D.
James, C. A.
Mortimer, J.
Schacht, F. F.
*Schacht, G. F.
Tilden, W. A.
Towerzey, A.
Troake, R. J.
Warner, G. T.
White, J. W.

Clitheroe.

Harrison, W.

Clones.

Murray, E. P.

Clonmel.

Reynolds, W. J.

Clontarf.

Robinson, J. O.

Clun, Salop.

Darroll, W.

Coalville.

Porter, J.

Cockermouth.

Robinson, W.

Codnor.

Farnsworth, T.

Colchester.

Cole, F. A.
Hammerton, E.
Shenstone, J. C.

Coleshill.

Sumner, J.

Colinsburgh, N. B.

Todd, T.

- Collumpton.**
 Foster, J.
- Colne, Lancashire.**
 Asquith, W. C.
- Compton Verney.**
 Hutton, H.
- Connah's Quay.**
 Jones, K. L.
- Consett.**
 Imrie, D.
- Cork.**
 Bannister, W.
 Beamish, G. P.
 Cooke, J.
 Goulding, W.
 Harrington, W.
 Jennings, F. M.
 Lester, T. R.
 Selkirk, J.
 Spencer, W. A. C.
 Sunner, R.
 Whitford, J. G. P.
- Cosham.**
 Baker, G.
 Baker, T. B.
- Coventry.**
 Astley, J.
 Barrett, F. J.
 Glover, H.
 Hands, R. M.
 Hinds, J.
 Hiscock, R.
 Hodgkinson, G.
 *Powers, E.
 Welton, H.
 Wyley, J.
 Wyley, W. F.
- Crawley.**
 Leach, J.
- Crediton.**
 Jackson, W.
- Crewe.**
 Bayley, W.
 Gray, J. T.
 Kay, J.
- Crewkerne.**
 Greaves, J.
 Harris, M. C. J.
- Crieff.**
 Harley, J.
 McKenzie, W.
- Cromarty.**
 Johnstone, W.
- Crook.**
 Wilkinson, W.
- Crowle.**
 Pickering, J.
- Croydon.**
 Clarke, A. H.
 Clarke, J.
 Long, H.
 Stannard, F. J.
- Cullen.**
 Kemp, J.
 Seivwright, G.
- Cupar, Fife.**
 Caw, J.
 Kemp, J.
- Dalkey.**
 Beggs, G. D.
- Dalkeith.**
 Storie, R.
- Darlington.**
 Robinson, J.
 *Swenden, J.
- Dartford.**
 Armitage, E. H.
 Horrell, A. E.
- Dartmouth.**
 Rees, W. H.
- Darwen, Lancs.**
 Shorrocks, R.
- Dawlish.**
 Cutcliffe, G. J.
 West, E. R.
- Deal.**
 Clarabut, J. B.
 McDiarmid, J. B.
- Denny.**
 Anderson, E. H.
- Denton.**
 Arrandale, W.
- Derby.**
 Barnes, B.
 Clifton, F.
 *Frost, G.
 Grindley, G. H.
 Hefford, C.
 Marshall, W.
 Monkhouse, H.
 Stevenson, R.
 Ward, J.
 Wilson, J.
- Devizes.**
 Stewart, E. H.
- Devonport.**
 Barrett, J. T.
 Breeze, G.
 *Codd, F.
- Dewsbury.**
 Foster, A.
 Fox, G.
- Diss.**
 Amyot, T. E.
 Cupiss, F.
 *Gostling, T. P.
 Gostling, W. A.
 Nicholson, D. G.
 Thrower, E. A.
 Whitrod, H. F.
- Dolgelly.**
 Roberts, J. C.
- Doncaster.**
 Cranridge, J.
 Hasselby, T. J.
 *Howorth, J.
 Shaw, H. W.
 Stiles, M. H.
- Dorchester.**
 Durden, H.
 How, W.
- Dorking.**
 Clift, J.
- Douglas, I. M.**
 Bowman, E. J.
- Dover.**
 Adams, R. W.
 *Bottle, A.
 Brown, J. F.
 Cotterell, W. H.
 Forster, R. H.
 Hambrook, J. B.
 Peake, H.

Driffield.

Bordass, J.
Parkinson, T.
Ross, L. B.

Droitwich.

Taylor, E.

Dublin.

Allen, C. A.
Allen, W.
Brunker, J. E.
Draper, H. N.
Evans, J.
Froedman, F.
Galwey, R. J.
Goodwin, J.
Griffin, C. H.
Hamilton, J. T.
Hartford, J.
Hartt, C.

*Hayes, W.
Holmes, J. T.
Murphy, W. C.
Nugent, —
Park, W. S.
Parefoy, R. D.
Queale, J. W.
Quinlan, F. J. B.
Reynor, A.
Scott, W.
Simpson, R.
Stoney, J. D.
Thompson, S. M.
Tichborne, C. R. C.
Wells, W. F.

Dudley.

*Dennison, M.
Fletcher, J.
Hollier, E.
Thompson, J. W.
(Sedgley.)
Voce, W. G. (Nether-
ton.)

Duffield.

Cutting, J.
Scriven, J. S.

Dufftown.

Proctor, A. D.

Dumbarton.

Babbie, J.
Binnie, R.

Dumfries.

Allan, W.
Fingland, J.
(Thornhill.)

Duncanstone.

Craig, G.

Dundee.

Anderson, A. B.
Davidson, J. A.
Esplin, A.
Hardie, J.
*Hodge, J.
Kerr, C.
Maxwell, D.
Miller, T. S.
Park, W.
Russell, J.
Young, C.

Dunfermline.

Seath, A.
Stiell, G.

Dungannon.

Marshall, R. C.

Dunkeld.

McDonald, K.

Dunse, N.B.

Gunn, W.

Durham.

*Burdon, J.
Burn, W.
Hayton, J. W.
Hunter, F. N.
Lambert, J.
Sarsfield, W.

Ealing Dean.

Linford, J. S.

Earlestown.

Peake, A.
Smith, J. F.

Easingwold.

Rookledge, J.

Eastbourne.

Hall, S.

East Dereham.

Abram, F. W.
Strangroom, F.
(Cley.)

East Grinstead.

Martin, H. S.
Tully, J., senr.

East Retford.

Appleby, C.
Fletcher, F. B.
Welbury, G.

Eastwood.

Ault, J.
Chambers, J.

Eccles.

Howie, W. L.

Edinburgh.

Ainslie, W.
Aitken, J.
Aitken, R.
Anderson, W.
Archer, T. C.
Baildon, H. B.
Baildon, H. C.
Blanshard, G.
Brown, D.
Buchanan, J.
Clark, W. I.
Coates, E.
Dott, D. B.
Ewing, J. L.
Fairgrieve, T.
Gilmour, W.
Guthrie, A. D.
Hay, M.
Laird, G. H.
Macadam, S.
Macadam, W. I.
McCowan, W.
Macdonald, J.
Macfarlane, A. Y.
McGlashan, D.
Mackay, G. D.
*Mackay, J.
Mackenzie, J.
MacLagan, D.
Macpherson, C. A.
Midgeley, J. H.
Moinet, F. W.
Morrison, D.
Napier, A.
Niven, W. R.
Noble, A.
Pinkerton, W.
Purves, S.
Raimes, R.
Smiles, J.
Smith, P. S.
Smith, T.
Stephenson, F.
Stephenson, J. B.
Symington, T.
Taylor, A.
Thompson, T.
Todd, J.
Wilson, J. M.
Wylie, D. N.
Young, J. R.

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|--|---|---|
| Ely.
Lincolne, N. | Fleetwood.
Lofthouse, J. | Dickie, J.
Fairlie, J. E.
Fairlie, J. M.
Fenwick, J.
Forrest, R. W.
Frazer, D.
Greig, W.
Guthrie, P.
Halley, A.
Harrower, P.
Hume, R.
Hunter, J. C.
Jaap, J.
Kennedy, W.
*Kinnimont, A.
Lindsay, T.
Lockhart, J.
McAdam, R.
Macewan, W. I.
McLeod, T.
M'Millan, J.
Muir, G.
Murdock, J.
Nairne, J. S.
Nicol, J.
Paris, W.
Paterson, A.
Paton, —
Pettigrew, J. W.
Pinkerton, J. S.
Rait, R. C.
Remmers, B. H.
Rose, A.
Schmidt, A.
Semple, J.
Stanford, E. C. C.
Tennent, G. P.
Twaddle, R.
Walker, T.
Wallace, W.
White, J.
Whyte, W.
Wyllie, A. |
| Emsworth.
Waters, H. G. | Flint.
Jones, M. | |
| Ennis.
Seymour, T. T. | Folkestone.
Goodliffe, G.
Lea, J.
Stainer, J. | |
| Enniscorthy.
Cooke, P. M. | | |
| Epping.
Rowland, T. T. | Forebridge, Staf-
ford.
Spilsbury, J. | |
| Esher.
Ling, E. | Forfar.
Anderson, D. S. | |
| Exeter.
Collett, C. B.
Cooper, G.
Delves, G.
Gadd, H.
Hunt, A.
Husband, J. C.
Napier, G. L.
Pasmore, G.
Shenstone, W. A.
Stone, F. W. | Formby, Lancs.
Blood, C.

Forres.
Michie, J. | |
| | Foulsham, Norfolk.
Newport, W. | |
| Exmouth.
Teed, D.
Thornton, S. | Frizington.
Allatt, F. T. | |
| | Frodsham.
Robinson, J. F. | |
| Eyam.
Froggatt, T. W. | Frome.
Harvey, W. B. | |
| Eye.
Bishop, R. | Gainsborough.
Clarkson, T.
Howlett, W. H. | |
| Falkirk.
Murdoch, D. | Gamrie.
Stephen, J. | |
| Falmouth.
Gutheridge, J. F.
Newman, W. F. | Gateshead.
Brady, H. B.
Elliott, R. | |
| Fareham.
Batchelor, C.
Franklin, A. | Glasgow.
Adam, T.
Black, J.
Brodie, R.
Buchanan, T. D.
Campbell, J.
Clarke, J. A.
Clark, S. P.
Cook, E. A.
Cowan, —
Currie, J.
Davison, T.
De Nance, W. C. | Gloucester.
Berry, E.
Meadows, H.
Medd, J.
Stafford, W.
Ward, J. |
| Farnham.
Dunston, A.
Higgins, W. | | Goole.
Roulston, B. W. |
| Faversham.
Lenfestey, W. G. | | Govanhill.
Steele, J. C. |
| Ferryhill.
Smith, R. | | Gorleston,
Gt. Yarmouth.
Thurlby, G. |
| Fethard.
Burgees, F. C. | | |

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|---|---|--|
| Gosforth.
Gaitskill, J. | Guisborough.
Bancks, A. | Haverfordwest.
Jenkins, J.
Saunders, D. P. |
| Gosport.
Mumby, C. | Guiseley.
Archer, J. S. | Hay.
Davies, J. L. |
| Gourock.
Barr, R.
Peters, J. | Hadfield.
Jones, J. | Hayle.
Williams, W. H. |
| Govan.
Dunlop, T. | Halifax.
Dyer, W.
Farr, J.
Pedley, T. (Triangle.) | Heanor.
Simpson, D. O. |
| Grantham.
Cooper, H. G.
Fisher, F. D.
Hall, T.
*Hopkinson, T.
Lunn, T.
Newcome, J.
Whysall, W. | Haltwhistle.
Milligan, D. G.
Bell, J. | Hebden Bridge.
Hey, D. |
| Grassington.
Chapman, W. | Hamilton.
Mackill, R. C.
Stewart, J. | Heckmondwike.
Booth, J.
Stephenson, J. N. |
| Great Bedwin.
Gerard, G. R. | Hanley, Stafford.
Jones, G. H.
Lloyd, J.
Smith, A. H.
Tirrell, J.
Wilson, W. | Helenburgh.
Harvie, G. |
| Great Malvern.
Metcalf, E. H. | Harleston.
Borrett, H.
Muskett, J. | Helmsdale.
Paterson, J. |
| Great Yarmouth.
Gardner, J. R.
Hayhoe, W.
Lee, J.
Skoulding, G. S. F.
Walpole, W.
Wright, J. | Harpenden.
Busby, J. | Helmsley.
Allenby, W. |
| Greenock.
Armitage, G.
Baine, J. A.
Duncan, S.
Fisher, T.
M Naught, A.
Stewart, G. C.
Wilson, G. | Harrogate.
Allanson, C.
*Coupland, J.
Davis, R. H.
Taylor, J. H.
Wilson, J. H. | Helston.
Troake, M. H.
Wakeham, C. |
| Grimsby.
Bottrill, G. T.
Cook, R.
Gossop, G. K.
Watson, H. | Hartlepool.
Harpley, R. B.
Warwick, D. H. | Hemel Hempstead.
Argue, G. |
| Guernsey.
Anderson, H. D.
Arnold, A. | Harwich.
Bevan, C. F.
Harding, J. | Hereford.
Walker, J. |
| Guildford.
Jeffries, H.
Vennall, G. (Cranleigh.) | Haslingden.
Falshaw, J. | Hertford.
Durrant, G. R. |
| | Hastings and St. Leonards-on-Sea.
Garratt, S.
Keyworth, G. A.
*Robinson, J. S.
Rossiter, F. | Hexham.
Riddle, W. R.
Turner, J. |
| | | Heywood.
Jackson, J.
Mills, W. H. |
| | | Hinckley.
Gilbert, G.
Pridmore, W. |
| | | Hindley.
Slingsby, C. S. |
| | | Hirwain.
George, J. E.
Simis, J. |

- Hitchin.**
 Ransom, W.
- Holsworthy.**
 Oliver, J. C.
- Holyhead.**
 Hughes, J. G.
- Holyrood.**
 Macaulay, J. J.
- Hollywood.**
 Guiles, J.
- Honiton.**
 Lee, W.
 Turner, G.
- Horncastle.**
 Carlton, W. P
- Houghton-le-Spring.**
 Rowell, R. H.
- Howden.**
 Latham, R. J.
- Huddersfield.**
 Cuthbert, R.
 Jarmain, G.
 Kaye, H.
 King, W.
 Rhodes, G. W.
 Swift, T. N.
- Hull.**
 Allison, E.
 Anholm, A.
 Baynes, J.
 Baynes, J.
 *Bell, C. B.
 Benson, J. L.
 Clarke, I.
 Dixon, J.
 Earle, F.
 Hall, H. R. F.
 Hammond, C. T.
 Hay, W.
 Lowther, M. K.
 Metcalfe, C. L.
 Milner, J. G.
 Myers, G.
 Oldham, J.
 Pickering, A.
 Soutter, J. S.
 Staning, W.
 Stoakes, B. M.
 Thomas, A.
- Hungerford, Berks.**
 Taylor, W. G.
- Huntley.**
 Shepherd, J. T.
 Beatt, D.
- Hyde, Cheshire.**
 Bount, F. H.
 Curfew, J.
 McClean, J.
 Oldfield, H.
 Wild, J.
- Hythe.**
 Lemmon, R.
- Idle, Yorks.**
 Hopton, E.
- Ilchester.**
 Barrett, T. G.
- Ilford.**
 Beal, E. J.
- Ilfracombe.**
 Ward, J. S.
- Ilkeston.**
 Merry, W.
 Potts, R. S.
- Invergordon.**
 Sinclair, R.
- Inverness.**
 Fraser, J.
- Ipswich.**
 Callaway, L.
 Clifton, E. S.
 Cornell, W.
 Grimwade, E.
 Sayer, E. C.
 *Wiggin, J.
- Ironville.**
 Greaves, W. S.
- Irvine.**
 Gillespie, J.
 Murdoch, G.
- Isleham.**
 Diver, B.
- Isle of Man.**
 Brearey, W. A. (Douglas.)
- Ixworth.**
 Thurlow, H.
- Jarrow-on-Tyne.**
 Rose, J. D.
 Watson, R. T.
- Jedburgh.**
 Peters, J. F.
- Jersey.**
 Ereaud, G.
- Keelby, near Ulceby.**
 Skinner, M. H.
- Kelso.**
 Conacher, D.
 Dodds, G. F.
- Kendal.**
 Bateson, T.
 Coulter, G.
 (Sedbergh.)
 Hind, T. W. L.
 Kirkby, R.
 *Severs, J.
- Kenilworth.**
 Barton, H. E.
- Keswick.**
 Henderson, M. J.
- Kettering.**
 Hitchman, H.
- Kidsgrove.**
 Griffiths, E. H.
- Kilkenny.**
 Sterling, W.
 Walters, J.
- Kilmarnock.**
 Borland, J.
- Kingsbridge.**
 Devon.
 Troake, W. H.
- King's Lynn, see Lynn.**
- Kingston-on-Thames.**
 Brewster, W.
 Tamplin, E. C.
- Kingstown.**
 Bennett, H.
- Kington, Hereford.**
 Stanway, W. H.

Kippax.
Wilkinson, R.

Kirkby Stephen.
Armstrong, J.

Kirkcaldy.
Coutts, A. (Path-
head.)
Gorrie, A.
Macknight, S. W.
Storrar, D.

Kirkintilloch.
Morton, T.

Kirriemuir.
Ford, J.

Knaresboro.
Thompson, J.

Lampeter.
Evans, J. W.

Lanark, N. B.
Cassels, T.
Chislett, C.

Lancaster.
*Bagnall, W. H.
Battersby, S.
Cardwell, E.
Clark, E.
Hall, W.
Vince, J.

Landore.
Thomas, H. J.

Landport.
Ball, W.
Hackman, L. L.
Stanswood, J.

Langharne.
David, S. S.

Largs.
Fraser, A.

Lauder.
Leal, A.

Launceston.
Eyre, J. S.

Laurencekirk.
Lawson, W.

Leamington.
Barnitt, J.
Bollans, E.
Davis, H.
*Jones, S. U.
Pullin, W. H.
Sansom, H.
Smith, S. A.
Spilsbury, J.
Woolcott, C.
Wright, W. F.

Lechlade, Glouces-
tershire.
Archer, J.

Ledbury, Hereford.
Freeman, E.

Leeds.
Abbott, J.
Barraclough, T.
Brooke, S.
Brooke, T.
Broughton, A.
Brown, E.
Brownbill, R. S.
Clapham, J.
Clapham, J. W.
Day, J.
Dunn, H.
Ebdell, J. T.
Exley, G.
Farndale, G.
Fawthorp, J.
Ferguson, W. K.
Greasley, M. F.
Hardman, J. W.
Hellowell, J.
Hill, F.
Holmes, J.
Horsfield, J. N.
Iredale, G.
Iredale, T.
Jefferson, P.
Longley, J. W.
Manfield, W.
Patchett, I.
Pocklington, H.
Powell, W.
Reynolds, F.
*Reynolds, R.
Saxton, J.
Smeeton, W.
Stead, T. B.
Steele, E. B.
Tate, J. L.
Taylor, S.
Ward, G.
Watson, J.

Wildsmith, E.
Wood, W. A.
(Hunslet.)
Yewdall, E.

Leek, Staffordshire.
Johnson, W.

Leicester.
Burrows, H. C.
Butler, E. H.
Carr, W.
Clark, J. W.
Dalmas, A. de St.
Harvey, W. R.
Lloyd, T. H.
Maxfield, J.
Meadows, J.
*Richardson, J. G. F.
Salisbury, W. B.
Slater, J.
Toone, J. H.
Wand, S.
Woodcock, J.
Young, J.

Leigh.
Whittle, S.

Leighton Buzzard.
Herington, J.
Richmond, R.

Leith.
Finlayson, T.
Meldrum, E. D.
Wilson, J.

Leominster.
Davis, D. F.

Lessness Heath,
Kent.
Heaton, C. W.

Leven.
Gibson, A.

Levenshulme.
Botham, G.
Hall, J. T.

Lewes.
Curtis, H.
Saxby, H., junr.

Leyburn.
Campbell, G.

Limerick.
Hance, T. S.
Laird, J.

Lisnaskea.
Thompson, L.

Little Bolton.
See BOLTON.

Liverpool.

*Abraham, J.
Abraham, T. F.
Alexander, J.
Ball, G.
Barber, G.
Barton, A. F. G.
Bathgate, W. L.
Billington, F.
Blabey, J. J.
(Woolton.)
Blain, A. H.
Buck, J. M.
Buck, R. C.
Chellew, W. D.
Cohen, N. S.
Conroy, M.
Dale, J.
Davies, E.
Driver, T. (Woolton.)
Evans, E.
Evans, E., junr.
Evans, E. P.
Evans, J. J.
Evans, J. R.
Flint, J.
Fraser, A.
Furniss, T.
Greenall, A.
Hall, T.
Hallawell, J.
Hocken, J.
Humphries, E.
Hunt, T.
Johnson, J. H.
Johnson, M. (Huy-
ton.)
Jones, F.
Lee, S. W.
Lewis, R.
Lloyd, J. W.
Lumby, A.
Marson, B. B.
Martin, J.
Mason, A. H.
McVitie, T.
Monkhouse, J.
Paddock, T.
Parkinson, R.
Peet, H.
Richardson, R. T.
Robinson, J. F.
Samuel, A. H.
Sergeant, T. W.

Shaw, J.
Sumner, R.
Symes, C.
Taylor, C.
Townson, W.
Troughton, C.
Walkden, J.
Williams, W.
Worthington, J. V.
Woodhead, J. T.
Wright, W. O.
Wyatt, H.
Wylde, S.

Llanberis.
Hobley, J.

Llandudno.
Penney, W. S.
Sinclair, J.

Llandyssal.
Evans, D.

Llanegryn.
Pugh, H.

Llanelly.
Evans, G.
Hughes, E.

Llanfyllis.
Williams, W.

Llangefni.
Hughes, R.

Llangollen.
Jones, H.

Llanwrst.
Jones, J.
Jones, O.

Loddon.
Ellis, T. W.

London, E.
Allen, W. H.
Arnold, G. J.
Best, J.
Bishop, A.
Bishop, W. B.
Burton, J. D.
Butler, C.
Clark, J. A.
Covell, W. M.
Dixon, J. B.
Eastman, J. E.
Fox, W.
Fox, W. A.

Frost, W. T.
Glassford, J. McL.
Goodwin, J.
Granger, E. J.
Hatfield, G. B.
Holford, T. C.
Howard, D.
Howard, W. D.
Kernot, G. C.
Kirk, S.
Knight, W.
Maizey, E.
Minshall, R. C.
Nicholls, T.
Owen, R. J.
Rayson, H.
Richardson, E.
Rogers, W.
Skipper, E.
Street, G.
Thorp, W., junr.
Tyrer, P.
Walker, C.
Wilkinson, B. J.
Wootton, A. C.

London, E. C.
Armstrong, H. E.
Attwood, A.
Barron, F.
Best, T. F.
Brown, H.
Burroughes, S. M.
Charity, W.
Cocksedge, H. B.
Colclough, W.
Constance, E.
Cooper, H.
Crawshaw, E.
Crispe, J.
Darby, S.
Evans, H. S.
Faries, T.
Fentiman, A.
Flux, W.
Foster, M. E.
Francis, G. B.
Francis, G. B., junr.
Francis, R. P.
Francis, W. H.
Froom, W. H.
Gadd, H.
Gedge, W. S.
Gething, W. B.
Grimwade, E. W.
Hampson, R.
Hanbury, C.
Hanbury, F. J.
Harvey, E.
Hawkins, T.

Heathfield, W. E.
 Herring, H.
 Hewlett, C. J.
 Hill, A. B.
 Hindsley, H.
 Hodgkinson, C.
 Hodgkinson, W.
 Hooper, L.
 Hopkin, W. K.
 Horner, E.
 Horner, E., junr.
 Howden, R.
 Hughes, L. S.
 Hugill, J.
 Huskisson, H. O.
 Jones, J. H.
 King, W.
 Knight, J.
 Langdale, E. F.
 Layng, R. C.
 Leath, J.
 Lescher, F. H.
 Lowe, A. J. G.
 Mackey, J. B.
 Marston, J. T.
 Mason, H. C.
 Matthias, J. J.
 Maw, C.
 Pasmore, F. R.
 Pattison, G.
 Pearson, C. T.
 Pedler, G. S.
 Penrose, A. P.
 Pond, G. P.
 Preston, J. C.
 Robertson, F. F. L.
 Rossiter, W.
 Schacht, W.
 Selleck, E.
 Simmonds, P. L.
 Slipper, J.
 Squire, A.
 Squire, W.
 Stewart, A. Y.
 Tannor, A. E.
 Thompson, H. A.
 Thompson, J.
 Tidman, W.
 Ward, J. S.
 Watson, T. D.
 Wyborn, J. M.
 Watts, W. M.
 Williams, J.
 Williams, W. J.
 Wink, J. A.
 Wyman, J.

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Applegate, E.
 Arundel, M. H.

Ball, G.
 Bird, J.
 Bradley, F.
 Broad, J. M.
 Buck, T.
 Clapp, E. F.
 Colchester, W. M.
 Coles, F.
 Collett, C. B.
 Darnill, C.
 D'Aubney, T.
 Dutchman, W.
 Farrow, C. H.
 Fitzgerald, A. H.
 Fletcher, F. W.
 Garner, T.
 Hall, T. H.
 Handley, C.
 Harris, W. W.
 Hodsoll, T. W. H.
 Jefferson, T.
 Jones, T. P.
 Kimber, B. T.
 Large, J. H.
 Lorimer, J.
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 Marsh, W. H.
 Milward, S.
 Morris, G. E.
 New, W. W.
 Owen, J.
 Parkes, J. P.
 Reboul, A. P.
 Rogers, J. R.
 Skipper, E.
 Stable, R. H.
 Stenhouse, J.
 Stevens, P. A.
 Strawson, G. F.
 Tipping, T. J. W.
 Trick, W. B.
 Whincup, W.
 Young, R. F.

London, N. W.

Allchin, A.
 Allen, C. B.
 Atkinson, J. G.
 Baily, J.
 Bailey, J. H.
 Barret, E. L.
 Bell, W. H.
 Betty, S. C.
 Biddiscombe, C.
 Bindloss, G. F.
 Chapman, J. J.
 Cottrill, J. W.
 Dunmore, G. H.
 Gale, H.
 Gaubert, S.

Glazier, W. H.
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 Henty, H. M.
 Hyslop, J. C.
 Johnson, J.
 Laws, J.
 Luff, A. P.
 Merrell, J.
 Newton, T. A. C.
 Pettinger, E.
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 Rhind, W. W.
 Sangster, A.
 Saunders, J. W.
 Stamp, E. B.
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 Symons, W. H.
 Taplin, W. G.
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 Tuson, R. V.
 While, W. J.
 Williams, W. D.
 Wills, J. L.
 Woodland, J.

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 Austin, H. F.
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 Balls, G.
 Bateman, T. H.
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 Birch, H. C.
 Bishop, W. M.
 Brown, A. J.
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 Cardwell, E.
 Churchill, H.
 Clarke, W. L.
 Clift, E.
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 Congreve, G. T.
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Elliott, J. D.
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 Sandy, F. W.
 Sargent, D. W.
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 Wright, G. H.
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Amooore, A. S.
 Ashton, W.
 Bannister, R.
 Barnes, J. B.
 Bicknell, W.
 Bourdas, I.
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 Brewster, W.
 Brooks, C.
 Burt, G. E.
 Churchill, H.

Colomell, D. B.
 Cooke, P.
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 Cromwell, O.
 Cross, J.
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 Deane, J.
 Duncalf, J. M.
 Dyer, A. J.
 Evans, E.
 Fenn, J. T.
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 Field, A. W.
 Frankland, E.
 Gulliver, W.
 Hall, F.
 Hanbury, D. B.
 Heath, E. A.
 Helmore, W. H.
 Hickey, E. L.
 Hilder, R. T.
 Holmes, W. M.
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 Hucklebridge, J. M.
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 Ive, W.
 Jones, H. S.
 Luff, R.
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 Newby, R. J.
 Palmer, P. L.
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 Roach, P.
 Robinson, R. A.
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 Schweitzer, J.
 Selley, J.
 Shepherd, J. F.
 Simpson, J.
 Smith, J. S.
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 Sutcliffe, J.
 Tippet, B. M.
 Truman, H. V.
 Tupholme, E. H.
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 Tyrer, T.
 Urwick, W. W.
 Walker, B. W.
 Wheeler, J. W.
 Williams, E.
 Williams, R.
 Wills, J. L.
 Witherington, S. H.
 Woodcock, R. C.

London, W.

Addington, W. B.
 Andrews, F.
 Backhouse, H. N.
 Barker, W. R.
 Barnard, J.
 Bascombe, F.
 Bathe, R. S.
 Bettie, J. A.
 Bird, A.
 Bird, W. L.
 Blades, F.
 Bowles, W. J.
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 Brownen, G.
 Bullock, J. L.
 Burden, E. M.
 Butt, E. N.
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 Clarke, I. S.
 Cleaver, E. L.
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 Cullen, R. H.
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 Edden, T. L.
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 Hardy, S. C.
 Hayles, B. H.
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 Hickman, W.
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 Hogg, R.
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Humpage, B.
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 McMillan, S. L.
 Marsh, E. R.
 Martindale, W.
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 Postans, A. W.
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 Probyn, C.
 Reynolds, J. J.
 Richardson, B. W.
 Richardson, G.
 Robbins, J.
 Robinson, W. P.
 Ross, F.
 Rotherham, C. T.
 Sandford, G. W.
 Sanger, W. A.
 Savory, A. L.
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 Sharpe, G. Y.
 Shaw, J. W.
 Shirliff, W.
 Smith, J. T.
 Smith, J. W.
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 Squire, A. H.
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 Squire, P. W.
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 Stevenson, W. L.
 Stirling, J. E.
 Storey, E. H.
 Stuart, J. E.
 Taylor, J.
 Thorn, J. J.

Tily, C. A.
 Titley, T.
 Trotman, A. C.
 Tucker, R. L.
 Verity, R.
 Vælleker, A.
 Watts, J.
 Watts, W.
 Waugh, H.
 Webb, E. A.
 Wells, T.
 Weston, S. J.
 Westrup, J.
 Wilkinson, T.
 Williams, J. J.
 Williams, W. H.
 Wooster, J. R.
 Wright, C. R. A.
 Wyles, W.
 Young, W.

London, W.C.

Akhurst, W. E.
 Attfield, J.
 Barber, J. S.
 Bentley, R.
 Bletsoe, J.
 Buckle, C. F.
 Challice, W. G. W.
 Cooper, H.
 Davenport, H.
 Davenport, J. T.
 Gerrard, A. W.
 Hartsborn, A.
 Henry, H. C.
 Holmes, C. J.
 Holmes, E. M.
 Huggins, R.
 Huskisson, H. O.
 Lamplough, H.
 Law, A.
 Mackey, J. B.
 McCulloch, F.
 Morson, J. P.
 Morson, T.
 Moss, J.
 Passmore, F.
 Pedler, A.
 Pugh, G.
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 Rich, S. W.
 Sainsbury, S.
 Senier, A.
 Stacey, G. H.
 Stacey, S. Ll.
 Starkie, R. S.
 Stevens, F.
 Stoker, G. N.
 Taubman, R.
 Taylor, C. W.

Thomas, H.
 Tuck, W. B.
 Turner, C. E.
 Warren, W.
 Willmott, W.
 Wright, A.

Londonderry.

Byrne, S. J.
 Taafe, H.

Longford.

MacManus, J. H.

Long Stratton.

Cooper, F. T.

Long Sutton.

Sutterby, J. N.

Longton.

Prince, A. G.
 Turner, F.

Louth.

Greenwood, J. T.
 *Hurst, J. B.
 Simpson, H. D.

Lower Broughton.

Clarke, J. T.

Lowestoft.

Clark, W. G.
 Good, T.
 Hulme, W. D.
 Pearse, W. F.
 Wright, A.

Ludlow.

Nickson, J.

Luton.

Hale, E.
 Wootton, P.

Lymm, Cheshire.

Evans, I. H.

Lymington.

Badcock, H.

Lynn, Norfolk.

*Atmore, G.
 Cocher, J. A.

Lytham.

Crozier, R.

Macclesfield.

*Bates, W. J.
 Hodgkinson, J.
 Wood, R.

- Macduff.**
 Cruickshank, J.
 Henry, J. H.
- Machynlleth.**
 Thomas, J.
- Maesteg.**
 Rees, J.
- Maidenhead.**
 Martin, R.
 Thompson, C. H.
 Walton, R.
- Maidstone.**
 Brown, R. D.
 Evans, D. C.
- Malvern Wells.**
 Johnson, T. S.
 Morgan, W. J.
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- Manchester.**
 Arton, R.
 Bengier, F. B.
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 Booth, W. G.
 Botham, J.
 Bowden, W.
 (Patricroft.)
 Brown, J.
 Brown, W. S.
 Bury, J.
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 Dale, J.
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 Drinkwater, P. B.
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 Gee, S.
 Gibbons, T. G.
 Gibson, J.
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 Gill, J.
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 Hilditch, T.
 Hughes, E. G.
 Hunt, L.
 Jackson, A. H.
 Jackson, B. F.
 Jackson, G.
- Jones, J.
 Kent, G. F.
 Ker, A.
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 Midgeley, C.
 Mitchell, J.
 Mumbray, H. G.
 Paine, S.
 Palmer, A. N.
 Payne, J. B.
 Peatson, H. R.
 Pidd, A. J.
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 Savage, J. W.
 Schorlemmer, C.
 Siebold, L.
 Standring, J.
 Sugden, S.
 Swinn, C.
 Terry, T.
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 Twemlow, R.
 Walker, S. J.
 Wallwork, J.
 (Tildesley.)
 Wealthall, A.
 West, T.
 Wheeldon, J.
 Wild, F.
 Wilkinson, G.
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 Wilson, H.
 Woodhead, W. H.
 Woolley, G. S.
 Woolley, H.
 Wyld, --
- Mansfield.**
 *Agar, W.
 Oldham, J.
 Patterson, D. J.
- Margate.**
 Hobbes, A. E.
- Market Harborough.**
 Bragg, W. B.
 Martin, W.
- Marlborough.**
 Rowe, P. M.
- Marsden.**
 Roberts, C.
- Marshfield.**
 Garland, J. F.
- Martham.**
 Green, F.
- Maryport.**
 Cockton, J.
 Dixon, J.
- Matlock Bath.**
 Tomlinson, W.
- Matlock Bridge.**
 Hodgkinson, J. S.
- Mayfield.**
 White, E. A.
- Measham.**
 Patrick, W.
- Melbourne, Derby.**
 Earp, J.
- Melton-Mowbray.**
 Wing, G. N.
- Merthyr.**
 Daniel, W. L.
 Lewellyn, R.
 Lewis, J.
 Thomas, R.
 While, W. J.
- Mevagissey.**
 Kemble, J.
- Middlesborough-on-Tees.**
 Middleton, J.
- Middleton.**
 Roberts, J.
- Mildenhall.**
 Chifney, G. J.
- Millom.**
 Evans, R.
 Richardson, T.
- Milnthorpe.**
 Fothergill, S.
- Minchinhampton.**
 Simpkins, J.
- Mirfield, Yorks.**
 Crook, C.
- Modbury.**
 Lakeman, N.

Moffat.
Black, J. H.

Mold.
Barker, R.
Williams, E.

Monmouth.
Key, W.

Montrose.
Burrell, G.
Will, W. W.

Morecambe.
Birkett, J.
Gardner, T.

Moreton Hamp-
stead.
Evans, C. E.

Mossley.
Buckley, J.

Mount Sorrel.
Tibbles, W.

Mountain Ash.
White, G. H.

Narpeth.
Howell, E. J.

Neath.
Hutchins, C.

Needham Market,
Suffolk.
Harrington, A.

New Barnet.
Field, J. J.
Young, R. F.

New Beckenham.
Bell, F. R.

New Brentford.
Wood, A.

Newcastle (Staffs).
Croydon, E. H.

Newcastle-on-
Tyne.
Bellerby, M.
Bolam, J.

*Brady, A.
Brockett, R. H.
Coates, J. M.
Crozier, W.
Dobson, J.
Lunn, J.

Frank, J. M.
Harcus, J.
Hume, A.
Ismay, J.
Ismay, J. G.
Jobson, R.
Kirkup, T.
Marley, W.
Marreco, A. F.
Martin, N. H.
Owen, W.
Pattinson, J.
Proctor, B. S.
Swan, J. W.
Todd, H. T.
Watson, M.
Webster, E. P.
Welch, T.

Newcastle-under-
Lyne.
Cartwright, W.
Gould, J.
Poole, J.

Newmarket.
Rogers, A. R.

Newport, I. W.
Millidge, W. H.

Newport, Mon.
Faulkner, H.
Garrett, J. O.
Paine, C.
Young, J.

Newport Pagnell.
Taylor, T.

Newport, Salop.
Picken, T. W.

Newry.
Connor, S.
Hamilton, W. R.

Newton Abbot.
Godfrey, F.
Ponsford, J.
Savage, J. W.

Newtown, Mont-
gomeryshire.
Lambert, W. H.

Newton Stewart.
MacCreath, J.

Northallerton.
Fairburn, J.
Warrior, H.

Northampton.
Berry, J. P.
*Bingley, J.
Blunt, J. H.
Dadford, T.
Druce, G. C.
Harris, J.
Jeyes, P.
Mayger, W. D.
Mayger, W. J.
Shipman, J. J.
Sindall, J. W.

Northwich.
Clough, J.
Lee, W.

Norwich.
Andrews, G. B.
Baker, P. C.
Caley, A. J.
Cooke, W.
Crook, W. G.
Cubitt, C.
Corder, O.
Cossey, J.
Eldridge, J. H.
Fitch, R.
Fuller, T. B.
Hayhoe, W.
Hill, A.
Nuthall, E.
Robinson, J.
Smith, R. B.
*Sutton, F.
Tice, R.
Watson, J. E. H.
Woodcock, P. D.

Nottingham.
Blankley, W.
Bolton, C. A.
Crackle, D.
Dadley, E.
Dennis, J. L.
Fitzhugh, R.
Guest, W.
Jackson, R.
Jenkins, J. T.
Johnson, B.
Manfull, H. J.
Mayfield, J. S.
Oakland, C.
Parker, W. H.
Parr, S.
Rayner, J.
Smith, W.
Smithurst, J.
Warriner, C. W.
Waterall, G. E.
White, F.
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- Nuneaton.**
 Iliffe, T. P.
 Lester, H.
- Oakham.**
 Plant, W. E.
- Oldcastle.**
 Gaynor, P.
- Oldham.**
 *Bagshaw, W.
 Berry, T.
 Braddock, H.
 Firth, W.
 Hargraves, H. L.
 Hurst, J.
 Jackson, J. T.
 Jackson, R.
 Parkinson, W.
- Oldmeldrum, N. B.**
 Daniel, A.
- Ossett.**
 Crispin, W.
 Moore, R.
- Otley.**
 Pratt, R. M.
- Oundle.**
 Roper, H. E.
 Turner, R.
- Over Darwen.**
 Cronshaw, C.
- Oxford.**
 Duck, W. B.
 Hitchcock, C. E.
 Houghton, T.
 Odling, W.
 Prior, G. T.
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 Thurland, H.
- Padiham.**
 Midgley, F.
- Paignton.**
 Merson, W.
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- Paisley.**
 Cullen, T.
 Hatrick, J. B.
 McMurray, J.
- Patricroft.**
 Bowden, W.
- Peebles.**
 Morison, G.
- Peel.**
 Cowley, W.
- Pembroke.**
 John, D. W.
 Treeweeks, R. H.
- Pembroke Dock.**
 Bowling, J.
- Penrith.**
 *Kirkbride, W.
 Redfern, T.
 Wilson, J.
- Pentraeth.**
 Elias, J. R.
- Penzance.**
 Cornish, H. R.
- Pershore.**
 Drew, J.
- Perth.**
 Donald, D.
 Gowans, J.
- Peterboro.**
 Bright, R.
 Read, H. H.
- Petersfield.**
 Edgeler, W. B.
- Pittenweem.**
 Crisp, D.
- Plumstead.**
 Ringrose, G.
 Clarke, W. H.
- Plymouth.**
 Allen, J.
 *Balkwill, A. P.
 Burdwood, J.
 Clark, R. J.
 Coker, O. C.
 Elliott, S., junr.
 Foster, F. H.
 Furneaux, W. H.
 Header, H. P.
 Lake, R.
 Lewin, A. C.
 Luke, R. S.
 Mark, G.
 Marshall, C. W.
 Moore, W. V.
 Netting, J. G.
 Stickey, S. T.
 Turney, S. B.
- Pontefract.**
 Spink, C. C.
- Pontypool.**
 Wood, W.
- Pontypridd.**
 Davies, J.
 George, B. A.
 Key, W. H.
- Poole.**
 Atkins, T. W.
 Penney, W.
- Portaferry.**
 Filson, A.
- Portarlington.**
 Staunton, G. H.
- Port Glasgow.**
 Wylie, T.
- Portobello.**
 Fitzgerald, A. H.
 Kemp, D.
 Nesbit, J.
- Portsea.**
 Spear, G.
- Portsmouth.**
 Howlett, H. T.
- Port Talbot.**
 Evans, E.
 (Aberavon.)
- Prescott.**
 Slack, J. K.
- Presteigne.**
 Hughes, W., junr.
- Preston.**
 Brown, W. B.
 Frill, W. E.
 Goring, R.
 Hargreaves, M.
 Hillidge, G.
 Mercer, J.
 Smith, W.
 Tomlinson, J.
 Warrall, T. W.
 Willan, W.
 Wright, J. A.
- Prestonkirk.**
 Trotter, J.

- Prestwich.**
Johnson, F.
Mercer, A.
- Queen's Ferry,**
Flintshire.
Turner, J.
- Queenstown.**
Houghton, R. W.
- Ramsbottom.**
Morton, J.
- Ramsey.**
Palmer, F. W.
- Ramsey (I. of Man).**
Laughlen, W.
- Ramsgate.**
Balch, E.
Daniel, S.
Fisher, F. W.
Fisher, H. A.
Fox, C. J.
Franks, A.
Gadd, W. F.
Hicks, R.
- Raunds.**
Swift, W. P.
- Rawtenstall, Lancs.**
Lord, L.
- Reading.**
Bailey, J. B.
Bartle, W.
Bradley, C.
Dowling, R.
Goodman, J. R.
Hill, J.
Little, H.
Welch, C.
While, W. J.
Wilson, J. P.
- Redcar.**
Dowson, J.
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- Redhill.**
Padwick, T.
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CUBLEY, W., Sheffield.	JERVIS, W., Sheffield.	WATTS, J., Attercliffe.
DOBB, J. T., Sheffield.	JOHNSON, E., Barnsley.	WATSON, E. T., Sheffield.
DUNHILL, W., Doncaster.	JONES, G., Workop.	WARD, W., Sheffield.
DUNHILL, G. H., Sheffield.	LEAROYD, E. R., Sheffield.	WARD, W., F.C.S., Sheffield.
ELLINOR, G., Sheffield.	LESLIE, G., Sheffield.	WOOD, A., Sheffield.
GEORGE, H., Sheffield.	MAYOR, T., Sheffield.	WOOD, J., Sheffield.
	MILLER, J. T., Sheffield.	

THE SITTINGS OF THE CONFERENCE WERE HELD IN

The FREEMASONS' HALL, Surrey Street, Sheffield,
ON TUESDAY AND WEDNESDAY, THE 19TH AND 20TH OF AUGUST, 1879.
Commencing at Half-past Ten a.m. each day.

MONDAY, 18th August.

The EXECUTIVE COMMITTEE met, according to notices from the Secretaries, at 8 p.m., at the Imperial Hotel, Castle Street.

TUESDAY, 19th August.

The CONFERENCE met at 10.30 o'clock a.m., adjourning at 1 p.m.; and at 2.30 o'clock p.m., adjourning at 5 p.m.

Order of Business:

Reception of Delegates.

Report of Executive Committee.

Financial Statement.

Report of Treasurer of the "Bell and Hills" Library Fund.

President's Address.

Reading of Papers and Discussions thereon.

PAPERS.

1. *Report on the Aconite Alkaloids.* C. R. A. WRIGHT, D.Sc., F.C.S.
2. *Report on the Proximate Analysis of the Rhizome of Zingiber officinalis.* J. C. THRESH, F.C.S.
3. *Soluble Essence of Ginger.* J. C. THRESH, F.C.S.
4. *The Growth and Development of Claviceps purpurea.* W. W. STODDART F.I.C., F.C.S.
5. *The Polarimeter and its Uses in Pharmacy.* C. SYMES, Ph.D.
6. *The Application of Chloroform in the Testing of Drugs.* L. SIEBOLD, F.I.C., F.C.S.
7. *Note on the Behaviour of Iodine to Chloroform.* L. SIEBOLD, F.I.C., F.C.S.
8. *Note on the Specific Gravity of Liquids.* L. SIEBOLD, F.I.C., F.C.S.
9. *Extraction of Pilocarpine.* A. W. GERRARD, F.C.S.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the Meeting, on invitation of the Local Committee, partook of Luncheon served in adjoining rooms.

WEDNESDAY, 20th August.

The CONFERENCE met at 10.30 o'clock a.m., adjourning from 1 p.m. till 2.30 p.m. The whole of the business of the Conference was completed this day by about 5 p.m.

Order of Business:

Reception of Delegates.

Reading of Papers and Discussions thereon.

PAPERS.

10. *The Valuation of Citrate of Iron and Quinine.* F. W. FLETCHER, F.C.S.
11. *Notes on Petroleum Spirit.* A. H. ALLEN, F.I.C., F.C.S.
12. *The Determination of Water in Iodine.* E. DAVIES, F.I.C., F.C.S.
13. *The Presence of Tannin in Gentian Root.* E. DAVIES, F.I.C., F.C.S.
14. *Amylic Alcohol and Amylic Nitrite.* Mr. D. B. DOTT.
15. *The Gelatinization of Tincture of Kino.* Mr. T. H. BAMFORD.
16. *Anhydrous Air as a Therapeutic Agent.* G. A. KEYWORTH, F.C.S.
17. *Quillaia Bark, its Chemical Composition and use in Pharmacy.* Mr. H. COLLIER.
18. *Note on Aricine.* JOHN ELIOT HOWARD, F.R.S.
19. *The Chemistry of Chaulmoogra.* J. MOSS, F.I.C., F.C.S.
20. *Note on the Estimation of Morphia in Turkey Opium.* PROFESSOR FLÜCKIGER.
21. *The Capacity of Different Organs to Absorb and Retain Arsenic in Cases of Chronic Poisoning.* N. P. HAMBERG, M.D.

Place of Meeting for 1880.

Election of Officers for 1879-80.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all Members attending the Meeting, on invitation of the Local Committee, partook of Luncheon served in adjoining rooms.

THURSDAY, 21st August.

The members of the Conference, on invitation of the Sheffield Committee, went for an excursion, through some of the most charming scenery of Derbyshire, to Haddon Hall and Chatsworth House. Luncheon was served at "Haddon," and at the village of Baslow the party was entertained at "high tea" before the return drive to Sheffield.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING IN SHEFFIELD, 1879.

THE Sixteenth Annual Meeting of the British Pharmaceutical Conference commenced on Tuesday, August 19th, at the Freemasons' Hall, Surrey Street, Sheffield, under the presidency of Mr. G. F. Schacht, F.C.S., of Clifton.

The following members and visitors were present during the meetings:—

- Ashby-de-la-Zouch.*—C. Matthews.
Ashton-under-Lyne.—W. Bostock.
Barnsley.—T. Lister. *Bradford.*—R. W. Silson.
Brighton.—T. Billing, M. Leigh, W. D. Savage.
Bristol.—W. W. Stoddart, J. Pitman, J. Boucher.
Buxton.—J. C. Thresh. *Carlisle.*—J. Holloway.
Chester.—G. Baxter. *Cheltenham.*—W. Barron.
Clifton.—R. M. Hatch, F. F. Schacht, G. F. Schacht.
Detroit, Mich., U.S.—H. A. Wetzel. *Derby.*—J. Ward.
Doncaster.—J. T. Hasselby, M. H. Stiles, C. T. Scaife.
Droitwich.—E. Taylor.
Dublin.—J. G. Bruncker, H. N. Draper, W. and Mrs. Hayes, Prof. C. R. C. Tichborne.
Edinburgh.—D. B. Dott, W. I. Macadam, J. Mackenzie, F. Stephenson.
Fallowfield.—W. Ramsden. *Glasgow.*—E. C. C. Stanford.
Gloucester.—H. Meadows. *Guildford.*—D. Williamson.
Harrogate.—R. H. Davies.
Huddersfield.—H. Kaye, G. W. Rhodes, G. Jarman.
Hull.—C. P. Bell, J. Oldham.
Kilkenny.—W. Sterling. *Kingstown.*—H. Bennett.
Leeds.—P. Jefferson, R. Reynolds, W. Smeeton, E. Yewdall.
Leicester.—J. W. Clark, A. de St. Dolmas, J. Meadows.
Liverpool.—T. F. Abraham, T. Hall, T. S. M. Hall, A. H. Mason, J. Shaw, R. Sumner, C. Symes.
London.—Prof. Attfield, W. R. Barker, J. Bletsoe, J. Bourdas, jun., S. M. Burroughes, M. Carteighe, H. Collier, C. Cracknell, E. Crawshaw, J. Dodwell, F. W. Fletcher, Prof. W. Foster, T. Greenish,

W. Hills, W. L. Howie, A. B. Lewington, H. Long, A. P. Luff, W. Martindale, W. B. Mason, J. H. Matthews, W. A. H. Naylor, F. Passmore, Dr. B. H. Paul, A. P. Penrose, S. Plowman, J. Robins, R. A. Robinson, W. P. Robinson, R. Rowe, G. W. Sandford, J. F. Savory, Dr. A. Senier, A. E. Tanner, C. Umney, W. Warren, J. Williams, W. Willmott, A. C. Wootton.

Louth.—H. D. Simpson.

Manchester.—F. B. Bengier, B. Robinson, L. Siebold, W. Wilkinson.

New Barnet.—R. F. Young. *Northampton*.—W. J. Mayger.

Preston.—W. Williams. *Rochdale*.—J. W. Bamford.

Sheffield.—A. H. Allen, F. Barber, R. Bennett, G. H. Bradford, J. Carr, T. Cocker, G. A. Cubley, J. T. Dobb, G. Ellinor, A. R. Fox, H. Hall, J. P. Hewitt, H. Hindle, J. Y. Hodge, W. Jervis, W. Johnstone, E. R. Learoyd, H. W. Maleham, G. T. W. Newsholme, J. Ottly, J. Preston, J. Turner, W. Ward, J. Watts, E. W. Wills.

Shepton Mallet.—G. Cottrill. *Southampton*.—R. Chipperfield.

Southport.—W. V. Radley.

Swansea.—N. M. Grose, W. Morgan.

Torquay.—H. Hearder, W. Hearder.

Tynemouth.—J. Atkinson. *Wakefield*.—J. L. Chaplin.

Wath-on-Deerne.—A. Hick. *Wigan*.—J. Phillips.

Worksop.—G. W. Jones. *Yeovil*.—T. C. Maggs.

York.—J. Clark, R. C. Dresser, W. T. Hey, J. F. Walker.

MEETING OF THE EXECUTIVE COMMITTEE.

A meeting of the Executive Committee was held on Monday evening, August 18th, at 8 p.m. Present—Mr. G. F. Schacht, *President*; Messrs. Stoddart, Reynolds, and Ward, *Vice-Presidents*; Professor Attfield and Mr. Bengier, *Hon. Gen. Secs.*; Dr. Senier, *Assist. Sec.*; and Messrs. Carteighe, Cubley, Ellinor, Greenish, Learoyd, Maleham, Mason, Thresh, Umney, and Williams.

The minutes of the previous meeting were read and approved.

Mr. Bengier submitted a draft report of the Executive Committee, which was adopted.

The President read a letter from Professor Attfield, in which the Professor tendered his resignation as Senior Honorary Secretary. A lengthy discussion arose respecting the mode of carrying out Professor Attfield's wishes, and it was ultimately agreed to ask him to retain his position as Senior Honorary Secretary for another year. Dr. Attfield acceded to the wishes of the Committee.

Professor Attfield then submitted proofs of financial statements

and programmes, which were adopted. He also reported that in answer to the special invitation to membership of the Conference addressed to all registered Chemists and Druggists not already members, which had been lately issued, he had received nearly three hundred applications. He submitted for election altogether the names of three hundred and fifty-six candidates. They were unanimously elected.

The subject of a General Index to the first ten volumes of the *Year-Book* was then discussed, the conclusion being that the Sen. Hon. Sec. should make inquiries respecting the probable expense of such an Index, and report the result to the Executive Committee.

Professor Attfield announced that Mr. Grose, of Swansea, would attend the General Meeting on Wednesday, to invite the Conference to visit Swansea next year, and he had no doubt that the invitation would be heartily accepted by the meeting.

The Committee then agreed upon a list of officers for the ensuing year, to be submitted to the approval of the General Meeting.

The following are the names of the members who were elected at this committee meeting:—

Allan, Mr. W., Dumfries.	Berry, Mr. J. P., Northampton.
Allen, Mr. B., Bristol.	Best, Mr. J., London.
Allen, Mr. C. B., London.	Bettle, Mr. J. A., London.
Allen, Mr. J., Plymouth.	Bird, Mr. J., London.
Allenby, Mr. W., Helmsley.	Bird, Mr. M. M., Blandford.
Andrews, Mr. G. B., Norwich.	Bishop, Mr. R., Eye.
Argue, Mr. J., Hemel Hempstead.	Black, Mr. J. H., Moffatt.
Arrandale, Mr. W., Denton.	Bonnett, Mr. T. B., Swansea.
Aston, Mr. W., Tarporley.	Bowden, Mr. T. L., Bristol.
Ayre, Mr. G., Thirsk.	Bowman, Mr. E., Douglas, Isle of Man.
Badcock, Mr. H., Lymington.	Bragg, Mr. W. B., Market Har- borough.
Baker, Mr. T. B., Cosham.	Brailsford, Mr. H., Battle.
Bally, Mr. E. F., Baldock.	Brocklehurst, Mr. W., Stockport.
Barrett, Mr. J. T., Devonport.	Brooke, Mr. S., Leeds.
Barton, Mr. H., St. Ives.	Brownhill, Mr. R. S., Leeds.
Baynes, Mr. J., Hull.	Brunt, Mr. F. H., Hyde.
Bayley, Mr. W., Crewe.	Buckley, Mr. J., Moseley.
Beatt, Mr. D., Huntley.	Burn, Mr. T., North Shields.
Beck, Mr. H., Wolverhampton.	Burnett, Mr. G. T., Taunton.
Bell, Mr. J., Haltwhistle.	
Bell, Mr. T., Ambleside.	

- Burgess, Mr. J. S., Salford.
 Buck, Mr. T., London.
 Buscall, Mr. H. J., Burton-on-Trent.
 Butler, Mr. C., London.
 Cannell, Mr. W., Wolverhampton.
 Cantrell, Mr. W., Chesterfield.
 Carr, Mr. G., Sheffield.
 Carr, Mr. W. P., Berwick.
 Carruthers, Mr. G., Bishop Auckland.
 Carter, Mr. T., Blackpool.
 Cartwright, Mr. W. A., Bolton.
 Caswell, Mr. H. W., Bath.
 Caunce, Mr. J., Turvey.
 Chamberlain, Mr. A. G., Rugby.
 Chapman, Mr. J. J., London.
 Chapman, Mr. W., Grassington.
 Chapman, Mr. H., Scarborough.
 Clark, W. I., D.Sc., A.I.C., Edinburgh.
 Clarke, Miss I. S., London.
 Clarke, Mr. J., Croydon.
 Clarke, Mr. W. H., Plumstead.
 Clarkson, Mr. T., Gainsborough.
 Clifton, Mr. E. S., Ipswich.
 Clayton, Mr. D. T., Boston.
 Clayton, Mr. J. W., Blackburn.
 Coates, Mr. E., Edinburgh.
 Cole, Mr. J., Barton-under-Medwood.
 Conacher, Mr. D., Kelso.
 Conroy, M., F.C.S., Liverpool.
 Cooper, Mr. F. T., Long Stratton.
 Cotton, Mr. J. M., Burslem.
 Covell, Mr. W. M., Hackney.
 Cowgill, Mr. B. H., Burnley.
 Cowley, Mr. W., Peel, Isle of Man.
 Cox, Mr. A. H., Brighton.
 Crackle, Mr. W. H., Nottingham.
 Cranbridge, Mr. J., Doncaster.
 Crisp, Mr. D., Pittenweem.
 Crook, Mr. W. G., Norwich.
 Cross, Mr. J., London.
 Crosby, Mr. J. M., Scarborough.
 Croydon, Mr. E. H., Newcastle, Staffs.
 Cubitt, Mr. C., Norwich.
 Curtis, Mr. C., Victoria.
 Davies, Mr. J., Torquay.
 Davies, Mr. J., Pontypridd.
 Davies, Mr. J. T., Swansea.
 Davidson, Mr. J. A., Dundee.
 Darling, Mr. W., Manchester.
 Darnill, Mr. C., London.
 Dixon, Mr. W., Sandwich.
 Donald, Mr. D., Perth.
 Drew, Mr. B., London.
 Drew, Mr. J., Pershore.
 Drinkwater, Mr. P. B., Manchester.
 Dobb, Mr. J. T., Sheffield.
 Dunlop, Mr. T., Govan.
 Dunn, Mr. T., Selkirk.
 Dunston, Mr. A., Farnham.
 Dyson, Mr. A., Bacup.
 Edden, Mr. T. L., London.
 Eddie, Mr. W., Aberdeen.
 Edwards, Mr. H., Caterham Valley.
 Edwards, Mr. T., Usk.
 Edwards, Mr. W., Whitehaven.
 Ellis, Mr. R., Aberystwyth.
 Evans, Mr. C. E., Moreton.
 Evans, Mr. J. W., Lampeter.
 Evans, Mr. D., Llandyssal.
 Evans, Mr. D. C., Maidstone.
 Evans, G., F.C.S., Llanelly.
 Evans, Mr. T. W., Aberdare.
 Evans, Mr. W. P., Liverpool.
 Falshaw, Mr. W., Whitehaven.

- Farndale, Mr. G., Leeds.
 Fenn, Mr. J. T., London.
 Fisher, Mr. T. W., Ramsgate.
 Fisher, Mr. J., Ashton-on-Ribble.
 Fitt, Mr. F. E., Barking, Essex.
 Fletcher, F. W., F.C.S., London.
 Forbes, Mr. J. W., Bolton.
 Foster, Mr. A. J., Rochester.
 Foster, Mr. F., Scarborough.
 Fox, Mr. C. J., Ramsgate.
 Fraser, Mr. A., Largs.
 Fresson, Mr. L. F., Stevenage.
 Garrett, Mr. J. O., Newport, Mon.
 George, Mr. B. A., Pontypridd.
 George, Mr. W., Swansea.
 Gibson, Mr. R., Manchester.
 Gilbert, Mr. W., London.
 Gill, Mr. G., Bingley.
 Gimblett, Mr. W., Ryde.
 Glegg, Mr. W., Aberdeen.
 Goodman, Mr. J. R., Torquay.
 Gordon, Mr. W., Aberdeen.
 Gordon, Mr. J., Aberdeen.
 Goucher, Mr. L. T., Sheffield.
 Green, Mr. F., Martham.
 Gregory, Mr. W., Bristol.
 Griffin, Mr. J. T., Birmingham.
 Guiler, Mr. J., Holywood.
 Hall, Mr. E., Luton.
 Hall, Mr. J., Wellington.
 Hamilton, Mr. W., Barrow-on-Humber.
 Hardy, Mr. J., Bishops Stortford.
 Harpley, Mr. R. B., Hartlepool.
 Hartshorn, Mr. A., London.
 Harrison, Mr. C., Manchester.
 Harrison, Mr. W., Clitheroe.
 Harwood, Mr. T. H., Yeovil.
 Hartrick, Mr. J. B., Paisley.
 Harvey, Mr. W. B., Frome.
 Hay, Mr. W., Winster.
 Hay, M., M.B., Edinburgh.
 Heald, Mr. S., London.
 Heathcote, Mr. H. C., Winster.
 Hefford, Mr. C., Derby.
 Hellowell, Mr. J., Leeds.
 Henry, Mr. J. H., Macduff.
 Henry, Mr. H. C., London.
 Hobley, Mr. J., Llanberis.
 Holroyd, Mr. W., London.
 Holt, Mr. A., Bolton.
 Hornby, Mr. E. P., Stockport.
 Horner, Mr. E., Barnsley.
 Horsfield, Mr. J. U., Rotherham.
 Horsley, Mr. T. W., London.
 Howell, Mr. E. J., Narberth.
 Hughes, Mr. J., Swansea.
 Hughes, Mr. J. G., Holyhead.
 Hutton, Mr. H., Compton Verney.
 Hyslop, Mr. J. C., London.
 Inglis, Mr. W. K., Sheffield.
 Jackson, Mr. W. T., Stalybridge.
 Jackson, Mr. B. E., Manchester.
 Johnson, Mr. B., Nottingham.
 Jardine, Mr. W. D., Birmingham.
 Jeffrey, Mr. H., Bristol.
 Jenkins, Mr. J., Haverfordwest.
 Jeyes, Mr. P., Northampton.
 Jones, Mr. D. W., Aberdare.
 Jones, H. W., F.C.S., F.R.M.S., Birmingham.
 Jones, Mr. J. P., Talgarth.
 Jones, Mr. M., Swansea.
 Jones, Mr. O., Llanwrst.
 Jones, Mr. W. J., London.
 Jones, Mr. W. O., London.
 Kay, Mr. T., Stockport.
 Kendall, Mr. J. H., Blyth.
 Kermode, Mr. R. K., Castle-town, Isle of Man.

- Key, Mr. H., Monmouth.
 King, Mr. W., London.
 Knight, Mr. W., London.
 Knights, J. W., F.C.S., Cambridge.
 Kirkby, Mr. W., Sheffield.
 Landell, J., M.D., Rio Grande.
 Latham, Mr. R. J., Howden.
 Laughlin, Mr. W., Ramsey, Isle of Man.
 Lawson, Mr. W., Laurencekirk.
 Layng, Mr. R. C., London.
 Leal, Mr. A., Lauder, N.B.
 Leigh, Mr. M., Brighton.
 Leslie, Mr. J., Sheffield.
 Lester, Mr. H., Nuneaton.
 Lockwood, Mr. G. A., Sheffield.
 Lofthouse, Mr. J., Fleetwood.
 Long, Mr. J. T., Bristol.
 Lowe, A. J. G., F.I.C., F.C.S., London.
 Lunn, Mr. T., Grantham.
 McBeath, Mr. J. W., Hartlepool.
 McHugh, Mr. H. S., Castleford.
 MacKirdy, Mr. J., Rothesay.
 McMillan, Mr. J. L., London.
 Macpherson, Mr. C. A., Edinburgh.
 Maizey, Mr. E., London.
 Marley, Mr. W., Newcastle-on-Tyne.
 Marsh, Mr. E. R., London.
 Marsh, Mr. W. H., London.
 Marshall, Mr. C. W., Plymouth.
 Marshall, Mr. R. C., Dungan-
 non.
 Martin, Mr. W., Market Har-
 borough.
 Mather, Mr. J., Bolton.
 Matthews, Mr. C., Ashby-de-la-
 Zouch.
 Matthews, Mr. T., Ross.
 Maxfield, Mr. J., Leicester.
 Maxwell, Mr. D., Dundee.
 Medd, Mr. J., Gloucester.
 Metcalfe, Mr. E. H., Great Mal-
 vern.
 Middleton, Mr. J., Middles-
 borough-on-Tees.
 Miller, Mr. W., Blayton-on-
 Tyne.
 Millegan, Mr. D. G., Haltwhistle.
 Mills, Mr. W. H., Heywood.
 Milward, Mr. S., London.
 Minshull, Miss R. C., London.
 Morson, Mr. T. P., London.
 Mount, Mr. W., Canterbury.
 Munn, Mr. C. H., Stourport.
 Netting, Mr. J. G., Plymouth.
 Oldfield, Mr. H., Hyde.
 Oldham, Mr. J., Hull.
 Ottey, Mr. T., Burton-on-Trent.
 Paddock, Mr. T., Liverpool.
 Parker, Mr. H., Blayton-on-
 Tyne.
 Parker, Mr. S., Bradford.
 Parry, Mr. C. D., London.
 Passmore, Mr. C. F., Chelten-
 ham.
 Paterson, Mr. S., Aberdare.
 Patrick, Mr. W., Measham.
 Pearson, C. T., F.R.B.S., F.L.S.,
 London.
 Peet, Mr. H., Liverpool.
 Percy, Mr. T. B., Truro.
 Perkins, Mr. J., Wolverhampton.
 Petty, Mr. T., Deddington.
 Pinyon, Mr. W., London.
 Pitcher, Mr. W. J., Boston.
 Pitman, Mr. E., Westbury.
 Porter, Mr. H., Lythgow, N.S.W.
 Presley, Mr. E., Bristol.
 Ramsden, Mr. W., Fallowfield.
 Rees, Mr. J., Maesteg.

- Richards, Mr. J., Swansea.
 Richards, Mr. J., Aberdare.
 Richardson, Mr. J., London.
 Richardson, Mr. T., Millom.
 Richardson, Mr. R. T., Liverpool.
 Roberts, Mr. C., Marsden.
 Robertson, Mr. D., Bervie.
 Robinson, Mr. W. P., London.
 Rogers, Mr. J. R., London.
 Ronchetti, Mr. T. A., South Stockton.
 Roper, Mr. J. A., Bristol.
 Ross, Mr. F., London.
 Rotherham, Mr. C. J., London.
 Rowell, Mr. R. H., Southsea.
 Rowland, Mr. T. T., Epping.
 Samson, Mr. H., Leamington.
 Sawyer, Mr. H., Carlisle.
 Scaife, Mr. C. J., Worksop.
 Schacht, F. F., B.A., Clifton.
 Scawin, Mr. T., Durham.
 Scott, Mr. W. H., Sandy.
 Seivwright, Mr. G., Cullen.
 Selley, Mr. J., London.
 Senior, H., A.I.C., F.C.S., London.
 Shemmonds, Mr. J., Bournemouth.
 Shenstone, Mr. J. C., Colchester.
 Shepherd, Mr. J. W., Settle.
 Shepherd, Mr. J. T., Huntley.
 Sherriff, Mr. G., Paignton.
 Simpson, Mr. D. O., Heanor.
 Sinclair, Mr. J., Llandudno.
 Slipper, Mr. J., London.
 Smith, Mr. A. H., Hanley.
 Smith, Mr. J. F., Earlston.
 Smithurst, Mr. J., Nottingham.
 Southwell, Mr. C. H., Boston.
 Spencer, Mr. T., Wokingham.
 Spink, Mr. C. C., Pontefract.
 Sprckett, Mr. W., Brighton.
 St. Dalmas, Mr. A. de, Leicester.
 Stammwitz, Miss L., London.
 Starkey, Mr. C. T., Plymouth.
 Stedman, Mr. W., Ashford.
 Stedman, Mr. R. B., West Mal-
 ling.
 Stephenson, Mr. J. B., Edin-
 burgh.
 Stephen, Mr. J., Gamrie.
 Stewart, Mr. J., Birkenhead.
 Stewart, Mr. R., Burmah.
 Stickler, Mr. F. M., London.
 Stirling, Mr. J. E., London.
 Stobbs, Mr. R., South Shields.
 Storie, Mr. R., Dalkeith.
 Sumner, Mr. J., Coleshill.
 Sutcliffe, Mr. G. H., Bacup.
 Takemura, K., F.C.S., London.
 Taylor, Mr. J., Bolton.
 Taylor, Mr. J., Torquay.
 Thomas, Mr. A., Hull.
 Thomas, Mr. H. J., Swansea.
 Thomas, Mr. W., Builth.
 Thompson, Mr. T., Edinburgh.
 Tomlinson, Mr. W., Matlock
 Bath.
 Townson, Mr. W., Liverpool.
 Treeweeks, Mr. R. H., Pembroke.
 Trick, Mr. M., Swansea.
 Turner, Mr. J., Sheffield.
 Turner, Mr. F., Longton.
 Walker, Mr. J., Hereford.
 Wand, Mr. T., York.
 Ward, Mr. J., Derby.
 Ward, Mr. J. S., Ilfracombe.
 Warren, Mr. W., London.
 Watson, Mr. H., Grimsby.
 Watson, Mr. W. H., Carnforth.
 Whitrow, Mr. B., Winchester.
 Wilkinson, Mr. R., Kippax.
 Will, Mr. W. W., Montrose.
 Williams, Mr. W., Llanfyllin.

Williams, Mr. R., St. Clears.
Williams, Mr. J., Aldershot.
Williams, Mr. J. T., Swansea.
Williams, Mr. T. N., Aberdare.
Williams, Mr. W. D., London.
Wilson, Mr. J., Leith.
Wilson, Mr. J. M., Edinburgh.
Wright, Mr. W. R., Chatteris.
Woodcock, Mr. P. D., Norwich.

Wrighton, Mr. T. H. G., Can-
nock.
Wood, Mr. F., Cheltenham.
Woods, Mr. W., Pontypool.
Worrall, Mr. T. W., Preston.
Wyborn, Mr. J. M., London.
Wylde, Mr. S., Liverpool.
Wylie, Mr. T., Port Glasgow.
Yates, Mr. D., Blackburn.

GENERAL MEETING.

Tuesday, August 19th.

Prior to the commencement of the general business—

Mr. W. WARD (Sheffield) welcomed the members of the Association on behalf of the Sheffield Committee, and after adverting to the pleasurable anticipation he and his *confrères* had enjoyed in the prospect of the visit of the Association to the town, said he trusted that the arrangements made were such that the members would carry away many vivid and lively impressions that would live in their memories for years to come.

RECEPTION OF DELEGATES.

The Senior General Secretary then read the following list of Delegates to the Conference :—

From the *Pharmaceutical Society of Great Britain*.—Mr. G. W. Sandford, President; Mr. G. F. Schacht, Vice-President; T. Greenish, F.C.S., Treasurer; and Messrs. J. Robbins, W. D. Savage, J. Shaw, C. Symes, and J. Williams.

From the *Pharmaceutical Society of Ireland*.—Professor Tielborne, President; and Messrs. J. E. Brunker, H. N. Draper, W. Hayes, E. M. Hodgson, and R. W. Pring.

From the *Bradford Chemists' Association*.—Mr. Silson.

From the *Bristol Pharmaceutical Association*.—Messrs. Pitman, W. W. Stoddart, and G. F. Schacht.

From the *Brighton Association of Pharmacy*.—Messrs. T. Billing and W. D. Savage.

From the *Glasgow Chemists' Association*.—Mr. E. C. C. Stanford.

From the *Hull Chemists' Association*.—Messrs. C. B. Bell and J. Oldham.

From the *Leeds Chemists' Association*.—Messrs. P. Jefferson, R. Reynolds, and E. Yewdall.

From the *Leicester Chemists' Association*.—Mr. J. W. Clark.

From the *Liverpool Chemists' Association*.—Messrs. T. F. Abraham, A. H. Mason, R. Sumner, and C. Symes.

From the *Manchester Chemists and Druggists' Association*.—Messrs. F. B. Benger, Robinson, L. Siebold, and W. Wilkinson.

From the *Sheffield Chemical and Pharmaceutical Association*.—
Messrs. G. Carr, J. T. Dobb, G. T. W. Newsholme, J. Preston,
J. Turner, and J. Watts.

Mr. F. Baden Benger, General Secretary, then read the following—

REPORT OF THE EXECUTIVE COMMITTEE.

It is again the pleasant duty of your Committee to report a satisfactory condition of the British Pharmaceutical Conference.

During the past year the various objects of the Association have been successfully promoted or accomplished.

The annual *Year-Book* was issued in good time, and fully maintained the reputation of its predecessors as a faithful *résumé* of pharmaceutical progress. The MS. of the 1879 volume is now in the hands of the printer, and its issue to members will take place as soon as the report of the forthcoming meeting and the Editor's introductory chapter can be added to it.

At a meeting of your Committee, held in London on October 2nd of last year, applications for grants of money to aid authors to defray the cost of materials used in carrying out stated researches were received and considered. It was resolved—"That £10 be placed at the disposal of Mr. Thresh for the purchase of materials for an analysis of the rhizome of *Zingiber officinalis*, and a comparative examination of the gingers of trade; that £10 be at the disposal of Mr. Gerrard and Dr. Senier for the purchase of the drug termed *Pituri*, and for the materials for its pharmaceutical and chemical examination; and, that £40 be placed at the disposal of Dr. Wright towards the cost of the materials for an investigation of the active principle or principles of Japanese aconite, and for an investigation of the active principles in the leaves and flowers of ordinary aconite."

Reports by Dr. Wright and Mr. Thresh will be presented.

At a second Committee meeting, held on July 2nd, Professor Attfield, Senior General Secretary, reported in detail the work done since the last meeting of Committee, including matters relating to the editing, printing and publishing, and delivery to members of the *Year-Book*; the grants in aid of research; correspondence respecting improper use of the membership of the Conference; correspondence respecting the Bell and Hills Fund books; compilation and distribution of the list of subjects for research; collection of

subscriptions; organization of the approaching meeting at Sheffield; correspondence with members likely to work on the Executive Committee in 1879-80; and arrangements for inviting all registered chemists and druggists not already members to join the Conference.

The very successful meeting held in Dublin last year will be still fresh in your memories. The pleasant relationships with our Irish brethren then formed or strengthened fully justified (if justification were needed) our acceptance of the invitation to visit Ireland, and proved with what satisfactory results two societies may form one Conference. In returning once more to its native land, approaching indeed its very birthplace, the Conference is welcomed with a heartiness which must be highly gratifying to its members, but which is so invariably extended to it that there is danger of our accepting it more as a right than a privilege. On the present occasion we have perhaps a special reason for remarking on the thoughtfulness which has characterized the arrangements of the Local Committee. It has been repeatedly urged that the objects of the Conference are best promoted by the avoidance of formal entertainments, and whilst fully appreciating the generous impulse which has so often in the past disregarded this perhaps not sufficiently strongly expressed conviction, your Committee venture to hope that the action of the Sheffield Local Committee in this particular may be allowed to form a precedent. The excursion, which usually takes place on the Thursday following the business meetings, affords an admirable opportunity for the renewal of old friendships and the formation of new ones; or, to quote the words of the first article of our constitution, of promoting "the friendly reunion of those engaged in the practice or interested in the advancement of pharmacy." The organization of reunions of this kind will, your Committee is assured, be always gratefully accepted by the Conference as an ample indication of the hospitable feelings of its entertainers.

Sufficient papers of pharmaceutical interest have been received to fully occupy the time which can be devoted to their reading and discussion at the present meeting. The names of many old and valued friends of the Conference appear in this list, as well as those of new contributors, to whom a cordial welcome will be given.

The Committee have to announce with much regret that at a meeting held last evening they received a formal communication from their valued Senior Honorary Secretary, in which he tenders his resignation of the post he has so long filled with such distinguished success. The communication runs as follows—

"Ashlands, Watford,

"August 16, 1879.

"To the President of the British Pharmaceutical Conference:—

"Dear SCHACHT,

"After sixteen years of pleasant labours as one of the Honorary Secretaries of our Association, I regretfully, and yet with a feeling of satisfaction at having done useful service, place my resignation in your hands. I thank my colleagues for the opportunities they have given me of joining them in promoting scientific development in pharmacy and good fellowship among pharmacists. From the birth of our organization we have all worked together with the utmost heartiness and harmony; and although I now return to the ranks, I trust I shall be allowed to continue to support the objects of the Conference with undiminished enthusiasm and with all the experience and knowledge I have gained as a member of the staff. I hope and believe that the welfare of the Conference and its objects has not suffered either at my hands as a secretary or during my secretaryship, and I do not resign until I have assured myself that that welfare will be maintained, if not enhanced, by the change or changes that will, I know, necessarily be consequent on my resignation.

"I am, dear Schacht,

"Yours faithfully,

"JOHN ATTFIELD."

The Committee felt that the changes involved in Professor Attfield's resignation were of so serious a nature that they shrank from the responsibility of accepting it until a very mature consideration had provided the means for meeting them with a fair prospect of efficiency, and at their earnest request Professor Attfield consented to continue the duties for one year more, in order to afford to them the necessary time. The Committee are sure every member of the Conference will concur in a feeling of real gratitude to Professor Attfield for this further manifestation of his self-denying devotion to the best interests of the Conference.

Professor Attfield then read the financial statement, and the statement of the Hon. Treasurer in account with the Bell and Hills Library Fund, which are as follows:—

FINANCIAL STATEMENT, 1878-79.

The General Fund.

The Senior Hon. Secretary in Account with the British Pharmaceutical Conference.

	DR.	£	s.	d.
Balance from 1877-1878		77	6	2
To Sale of Year-Books by Secretary		15	0	0
„ „ „ Publishers		39	3	4
„ Advertisements in 1873 vol.		0	3	2
„ „ 1874 vol.		1	0	0
„ „ 1877 vol.		14	9	3
„ „ 1878 vol.		126	1	0
„ Subscriptions from Members		740	16	4
		<hr/> £1013 19 3 <hr/>		

	CR.	£	s.	d.
By Expenses connected with Year-Book :—				
Butler & Tanner for printing, binding, and banding	£410	5	9	
Editor's Salary	150	0	0	
Messrs. Churchill :—				
Commission on Advertisements	35	8	4	
Advertising Year-Book	2	3	0	
Delivery to Members	53	16	9	
Foreign Journals (Nutt)	3	4	6	
		<hr/> 654 18 4 <hr/>		
„ General Printing :—				
Butler & Tanner	3	15	0	
Stevens & Richardson	3	15	3	
Parkins & Gotto	7	2	7	
		<hr/> 14 12 10 <hr/>		
„ Printing and postage of 10,500 Invitations to Membership		86	10	8
„ Directing Circulars and Envelopes		5	0	3
„ Assistant-Secretary's Salary		40	0	0
„ Postage (about 10,000 letters)		41	10	0
„ Sundries		13	1	6
„ Expenses of Meeting at Dublin		12	6	4
„ Purchase of a few sets of Year-Books, 1870-72		24	3	4
„ Grants in Aid of Research		50	0	0
„ Balance to Treasurer		71	16	0
		<hr/> £1013 19 3 <hr/>		

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1878.	DR.	£	s.	d.
To Balance in hand on July 1st		33	7	5
July. To Dividend on £250 Consols		3	13	6
1879.				
Jan. To Dividend on £250 Consols		3	13	6
June 30. To Cash from Hon. Sec.		71	16	0
		£112	10	5

1879.	CR.	£	s.	d.
Jan. 29th. By Power of Attorney		0	6	0
By Balance		112	4	5
		£112	10	5

	£	s.	d.
Assets July 1, 1879 { Cash in hand	112	4	5
{ Consols (stock)	250	0	0

The Bell and Hills Library Fund.

The Hon. Treasurer in Account with the British Pharmaceutical Conference for Year ending June 30th, 1879.

1878.	DR.	£	s.	d.
To Balance in hand on July 1st		5	4	1
July. To Dividend on £350 Consols		5	2	9
1879.				
Jan. To Dividend on £350 Consols		5	2	9
		£15	9	7

1879.	CR.	£	s.	d.
By Purchase of Books for Sheffield		10	10	0
„ Balance		4	19	7
		£15	9	7

	£	s.	d.
Assets July 1, 1879 { Cash in hand	4	19	7
{ Consols (stock)	350	0	0

Examined and found correct, { W. HAYES, Dublin. } Auditors.
 { G. A. CUBLEY, Sheffield. }

The PRESIDENT moved the adoption of the report and financial statement, and referred with great satisfaction to the fact that Professor Attfield had, waiving all personal feeling, decided to continue his services for one year longer, and said he had no doubt that he would act with the same energy, ability, and skill as heretofore.

Mr. G. ELLINOR (Sheffield), in seconding the motion, adverted to the prosperous condition of the funds, which he was sure would be used well in promoting the welfare of pharmacy in general in connection with the Conference.

The motion was then put to the Conference, and carried unanimously.

Professor ATTFIELD read a communication which the President had received from Mr. H. B. Brady, one of the oldest friends of the Conference, apologizing for not being able to attend the meeting, and stating as evidence of the wide-spread influence of the Conference that he had observed in Japan that a native firm of booksellers offered the *Year-Book* for sale at four and a half dollars per volume.

THE GIFT OF BOOKS.

Professor ATTFIELD explained that the sum of ten guineas, placed at the disposal of the Committee from the Bell and Hills Library Fund, had been expended for the purchase of such books as the officers of the Local Association thought would be the most useful in their library. In addition to those books there were two others—Hanbury's 'Science Papers,' and Flückiger and Hanbury's 'Pharmacographia,' presented to the Local Association in memory of Daniel Hanbury by his brother Thomas Hanbury. There were, moreover, along with these books, engravings of Jacob Bell, William Allen, and Jonathan Pereira, offered to the Local Association by Mr. Thomas Hyde Hills.

Mr. WARD and Mr. LEAROYD returned thanks on behalf of the Sheffield Association.

Mr. SCHACHT then proceeded to read the following—

PRESIDENT'S ADDRESS.

Amidst the customs which rule this Conference in its relations with its President are two that in their co-existence may not always conduce to fortunate results. The same individual is retained in his exalted position for two consecutive years, and he is expected to deliver an address on the occasion of each Annual Meeting.

In defence of the latter, it may perhaps, with other considerations be reasonably urged that he who is selected by the voice of this Association to a dignity so distinguished as the occupancy of this chair, may fairly be expected to have something to say to his fellow pharmacists, gathered from either his personal knowledge, his experience, or his aspirations, worthy of being uttered. But when he finds himself called upon to repeat the duty after the short interval of one year, he may be excused for feeling, as I feel, that his chance of enlisting the interest of those who listen is sadly diminished, and that he must, even more earnestly than on the occasion of his former effort, hope for indulgent sympathy.

In days gone by, the course of events during the current year, so far as they affected scientific pharmacy, assisted much to indicate the plan and scheme of a Presidential Address; and some of the ablest discourses recorded in our annals consist chiefly of judicious summaries of the progress of the sciences connected with our calling and of such movements within and outside our body as appeared to affect pharmaceutical culture. But the conditions which rendered such a course wise in the earlier Conference days are now much changed. The same interest, perhaps even greater interest, is felt in those matters, but the work of summarizing them appears to have passed to other hands.

The press, which is ubiquitous, and whose chiefest apparent function is to absorb most other functions, has grown strong in our midst, and able editors obligingly offer to us all month by month, and journal by journal, a taste of the plums and a slice of the pie your President might otherwise be fondly regarding as destined for his own gathering and maturing as a *bonne bouche* for his expected guests; and to complete his discomfort lurks the conviction that should even a stray blossom escape this scrutiny and he succeed in impressing it to his service, the Conference itself, in its own elaborate and well ordered *Year-Book*, will, a few weeks later, completely extinguish his puny entertainment, and make the remembrance of it stale and flat.

The area for my choice appearing thus somewhat narrowed, I endeavoured last year to select a subject which for complete consideration would afford matter for two addresses, and which yet could be so arranged that the portion first delivered might stand fairly well by itself should any cross stream of events interfere with the original purpose, and I finally determined to make, as well as I could, two presentments of the same fact, viz., the pharmacist as we see him ourselves, and the pharmacist as seen by others; and

further, should those two images be found to differ (and I scarcely expected them to coincide) to reflect upon some of the points that difference might suggest.

Last year then I offered the first part of this scheme, a view of the pharmacist as seen by ourselves.

It would doubtless be wrong to assume that the picture then offered was universally approved; but I know it to have been the result of truth-seeking observation, and twelve months' further experience assures me that it was fairly correct. I find that the more I know of my fellow-labourers, the more good stuff I see in them, and the closer I become familiarized with the work they are doing, the more I am able to respect it. Hence I feel no hesitation in repeating the opinion expressed last year, that the typical pharmacist "stands the illustration of a high order of citizen."

But, lest there be danger that such an estimate resting long unchallenged provoke conceit, let me turn to what may prove an antidote of the severest kind, viz., the estimate of ourselves by others.

Already I can fancy that the recollection of a well-worn couplet has passed through many minds, and has prepared their conceit, had it begun to develop, for a heavy fall—

" Oh, wad some power the giftie gie us
To see ourselves as others see us : "—

for whatever was really prevailing in the poet's mind when he penned those lines, the usual sense in which they are quoted is one that implies erroneous self-estimate, on the one hand, and wisdom, superior if not supreme, on the other; and by this reading I and those who are inclined to support my views ought to stand convicted by a jury of our own choice, not only of great conceit, but of great folly also. But to such a position and to such a verdict I demur. A solicitude to ascertain what others think of us need not necessarily coincide with any such relation. "Whom do men say that I am?" was the inquiry of One we should be little inclined to charge with folly or conceit; it was "men," not the speaker, that were likely to be the better for a correct appreciation of the speaker's self; and at the risk of being charged with an unwise comparing of small things with great, I venture the opinion that what the public think of us pharmacists is of graver import to the public than to us.

Every art must rest its claim for existence upon some great public want. The universality of disease created the art of medicine.

The cure or relief of human suffering is the great aim and purpose of that art, and hence in its pure and wholesome progress, every single creature of the public must ever have the profoundest interest. If public ignorance or public prejudice in any way warps that wholesome progress, it is the public that chiefly suffer; they are the many, we are the few; the penalties we may be called upon to pay are but sectional, theirs must be universal. We have but to accommodate ourselves to the conditions, they have to endure them. Conversely, should the public wisdom tend, but in the least degree, to favour the full, fair, scientific progress of medicine, the benefit must be experienced in a thousand-fold degree where there is a thousand times the capacity for its reception.

Does that wisdom then display itself in a fashion most conducive to the best interests of the public? Let us frankly and gratefully answer, that in many respects it is manifested with high intelligence, and with noble generosity. The hospitals that adorn our entire land, and many of the laws that grace our statute books stand among the living monuments of both; moreover, few of the recognised professors of medicine pass through the labour of their lives without achieving fair reward in honour or in money; perhaps I might truthfully say in honour *and* in money. And if the same or similar sentiments prevailed towards pharmacy and its professors, the two presentments I am supposed to be offering would probably coincide, and I should have to say but little more on this topic to-day. But with the majority of the public, certainly with the section that is called "society," this is not the case, and but little of the honour, and as little as possible of the money, is given to us in exchange for our life-long work. The sole monuments of *our* professional existence are of our own raising, and "a house" can scarcely be got together to consider a bill, having for its object the regulation of so *uninteresting* a matter as pharmacy. It is true we are credited with being concerned in a "clean" sort of business, from which we are oddly enough accused of making very small incomes out of very large profits; we are admitted to possess decent shops which it is not unseemly to enter, and which indeed it is quite correct to make use of for any purpose not demanding a fee; we are supposed to be bound by some law of custom (certainly not by any sense of duty) to obey all behests, at all hours, on all days; we are credited, in short, with being "society's" most obliged and humble servants, slavishly ready to do whatever is told us, and to take for payment whatever cannot be conveniently bestowed upon the professional man on the one hand or the co-operative stores on the other. To

find a man or woman "in society" content to be publicly seen in friendly talk with a pharmacist, or indeed permitting the association of their children with ours at a public school, is to see a phenomenon of rare order. The doctor is the lady's and sometimes the gentleman's hero; the pharmacist is the tradesman to both.

Such, I fear, is the view very generally taken of us by others, and I need scarcely say this presentment does not coincide with the one I offered last year. Shall I endeavour to account for the difference before passing to other reflections?

With my already declared estimate of ourselves, and of our art (so different from my lady's), it is natural I should conceive that the phenomenon may be traced through a course that lies mainly outside us; and remembering how many-headed is that great outside public, how prone to the instinct of speciation, and how prone is each species to become absorbed in matters of its own concern, taking impressions of other things mainly at second hand, seldom by original effort; I have thought that the first step should consist in the search for that section of the outside world which is likely to be chiefly responsible for the delivery of the initiatory bias.

A very short consideration leads to the suggestion that the public would almost instinctively assume that the doctors would know more about pharmacy and pharmacists than any one else, and therefore that what they thought about us, and the attitude they assumed towards us, would be the proper thing to adopt and to imitate. And the public would have much to justify such an assumption.

More or less the story is known to all (and the more it is remembered the better) that for a long period, until in fact quite recent times, pharmacy constituted both practically as well as theoretically an integral portion of the medical art, and the pharmacist and the physician were one man. It is true this later condition no longer obtains; it has been found desirable to entrust the different departments to distinct sets of hands, in order that each may be worked to its fullest perfection, and under the completest personal responsibility. But the art remains the same, one portion being no more capable of repudiating another or declaring its independence of the rest, than is the eye or the heart of the human body.

And hence this assumption of a kind of perpetual alliance between the professors of all its departments would be both instinctive and reasonable, and the estimate of the one by the others would be deemed authoritative.

Whatever, then, the public estimate of us may be, I think it is

mainly the echo and the reflection of that previously adopted by our neighbours, the doctors. I do not mean that they would pronounce as right the treatment which I have asserted so many of us receive at the hands of the public, but that their general tone and manner towards us have furnished the germ which has thus fructified.

But does our experience with the profession justify this interpretation of their views towards us?

I have heard of cases, and have experience of cases, in which individual members of the profession have manifested, by their thoughtful treatment of all pharmaceutical matters, an appreciation of their importance so high and just, and a respect for those engaged in them so fair, that, were the question to be answered from such examples, the reply would be to the effect that there is no justification for it whatever. I fear, however, that these cases are exceptional.

Of the large majority, some, the greater proportion, are as nearly as possible indifferent to ourselves and to our work.

There exists, however, a third section of the profession, and I trust it is a diminishing one, that holds us at a very low estimate, that professes to believe us systematically familiar with mean doings, and open to mean temptations.

From the first of these divisions I pass with a cordial expression of respect, my chief hopes for the bettering of pharmacy in the future resting with its honoured members—from the last with a hope that they may be speedily delivered from their delusion; and our business for the present lies with the indifferentism that remains, and which is unfortunately only something less damaging than actual hostility. How is it to be accounted for?

I believe it to be mainly due to want of knowledge in two important directions. This large majority of medical men do not know enough of *our* subjects to appreciate them at their proper value, and they do not know the extent of our professional qualifications sufficiently well to give us due credit for them. Notwithstanding the fact to which I have already referred, the essential oneness of all the subjects that together make up the art of medicine, in no modern medical school do chemistry, botany, and pharmacy rank in educational importance with, let us say, anatomy, surgery, and medical practice; the former are the off-subjects, and are very generally done any-how or no-how; the latter are among the prime subjects, and must be done well. The traditions of the school enlist all the student's enthusiasm for what are called the medical subjects proper,

and as an inevitable consequence, a sentiment near akin to contempt pervades his view of the rest. Caring but little for them in the abstract, and taught to think but little of their practical value to his art, the student of medicine when he becomes the professor is but little likely to respect very highly even those he is compelled to admit as their recognised professors, and from the curious separation that has hitherto characterized the training of the pharmaceutical and the medical student, all that the latter knows of the former amounts to but hearsay, and he finds no particular reason in after-life to mature or enlarge his information.

For this state of things we must ourselves take some share to blame. This is no doubt that ignorance of matters that should have ranged within our knowledge did, in past times, prevail, and, since miraculous changes in social phenomena do not frequently occur, that ignorance may not have entirely yielded yet; but a great effort for improvement has been made, an effort, be it remembered, entirely from within our own body, and its practical results have been sufficiently remarkable to suffice in a large degree to absolve us from that portion of the blame.

But the very circumstance that appears to stamp pharmaceutical progress as unique, and to give it a special dignity,—I mean its self-originating and self-sustained character,—has largely tended to limit all knowledge of it to those who have specially watched the phenomenon or taken part in it.

The policy of those who initiated, as of those who continued the effort, was one that all can respect for its independence, but which I cannot but fear time and experience will show to have been, in this one important respect, unwise. It has served to intensify isolation where unification should prevail. The withdrawal of ourselves and our educational processes from the general professional ken has tended to encourage the elimination of the sciences we specially cultivate from the complete medical curriculum, and to foster the notion I have already deplored, that they are accessories of inferior value, and non-essential to medical culture. For this we must still bear our share of the blame.

But wheresoever the blame should chiefly lie, I think that the fact of the practical isolation of pharmacy and its professors from the rest of medicine is due to the general defective acquaintance on the part of the professed medical man with both our subjects and our men.

I must now pass to a consideration of the loss to the art of medicine that accrues from so extended an indifference to the pharmaceu-

tical sciences. It would perhaps be in better taste to let others speak to this point rather than myself. I am content, therefore, simply to remind you of the frequent publicly expressed lament of many distinguished physicians that so much of their practice is still perforce empirical, and of their equally emphatic rejoicings when some ardent student of science has succeeded in wresting from its mysteries some secret that has offered a glimmer of firmer resting-ground for their doctrines. The teaching of her highest authorities tell us that medicine cannot afford to fling away the help of her natural allies; that she is exposed to constant attack at almost every point; that her growth is not in perfect comeliness and undisturbed proportions, but is liable to distortions and excrescences of formidable type; and that her best hopes for future progress rest in the patient scientific work of her acutest and largest-brained sons—men who have the power to enlist within their sympathies every department of knowledge that can bring its great modicum of truth and focus all upon that one supreme point, the problem, life.

I think that among the first regions such men would wish to explore are the very subjects in which we are daily engaged; and with such aspirations animating the great mind of medicine on the one hand, and such opportunities existing for practical co-operation on the other, is it not the simplest of all possible deductions that an effort serving to bring all into better mutual estimation and closer mutual confidence, must be attended with a fair hope of distinct gain to the art itself.

So far I have attempted to show what the public estimate of us is; who are chiefly responsible for it; the probable causes that have led to it, and the mischief to medicine that attends it.

One more consideration must be stated in order to show that the error is, as I have said, of great practical interest to the public itself.

We are not above the influence of that estimate.

Who in this world, whether the question be asked of individuals or of communities, is so strong, either in good or evil, as to be able to resist such influence? Is "the publican" likely to become a patriot for being daily declared to be an outcast? Branded as a social enemy, an enemy he will continue or become. Should we presume to expect brave deeds in the field if we systematically treated our soldiers as cowards? Brave deeds alone being assumed as possible, brave deeds are done. In short, the opinion of society reacts in a thousand ways upon society's elements; and I fear the

constant treatment to which some of us are subjected,—that says more forcibly than words can say, “You druggists are but hirelings, labouring like hirelings for greed: take your pay and be thankful”—exerts a power for degradation that cannot fail to promote the very condition it professes to reprobate.

I say that for its own sake the public should make haste to see that we are of stuff much better than this.

I am quite aware that at every step of these statements their accuracy may be challenged; I have attempted to do this myself in many ways, and during the process have had to admit, from our own side, how often my standard of pharmaceutical excellence is missed, and that ignorance, carelessness, and looseness of principle are to be found amongst us; and from the other side, that many just and considerate individuals can be found in English society, as also doctors whose scientific culture is as ample, and whose disposition to make the most of ours is as generous, as heart could desire. Nevertheless, having taken these and kindred facts into full consideration, I allow the statements to stand as what I believe to be the truth.

But to another challenge I have perhaps also laid myself fairly open, namely, to suggest some remedy for the condition of things I profess to have studied and to deplore. To this challenge I have but what may appear a feeble reply: I am prepared with no mature scheme, and can offer nothing that can claim to be regarded as a cure for all that is wrong; but being most anxious to see ground broken in the direction that appears to me most hopeful for the extinction of the isolation that besets us, and thus give opportunity for a clearer view of ourselves and our doings to the rest of the profession, I am ready to suggest a first step. It is, that every student in medicine, whatever department of the art he may be aiming for as the sphere of his ultimate work, be brought at some period of his training through one single portal. So many practical objections have been found to exist against the mingling of medical and pharmaceutical students during their attendance at classes or during any portion of their actual studies, that I think the portal would have to consist of one of the sets of examinations; but if that examination could be made a common one for all, whether ultimately destined for Medicine or Pharmacy, the step would be a useful one. It would serve to declare with authority that certain scientific studies were equally essential in all the departments of the medical art; and it would demand of every student that he attain the required standard of proficiency in them. He would thus be prepared

by actual personal knowledge (not through the traditions of his school) to estimate aright the proportionate value of those attainments towards his professional equipment; he would realize the serious amount of effort required to achieve that knowledge, and he would naturally conceive a feeling of respect for all who had laboured for its acquisition even as he himself had laboured.

Whether such an experiment would be attended with results proportionate to the distinctness of the change, requires a better prophet than myself to declare. As far as we are concerned, it would be the commencement of a reversal of much of our past policy. It would tend *from isolation towards unification, from estrangement towards co-operation, from suspicion towards trust*; but these very words seem to me to be full of hope.

One possible comment upon the suggestion itself I should like to anticipate; it may appear to some to involve the placing of our examinations in the hands of the medical profession.

Were this the only course open for adoption, I should not shrink from its close consideration, nor fail to entertain it with great hope of ultimate benefit, but at present I do not think this by any means a necessary consequence. The story of our own progress, and my personal knowledge of the completeness of the organization that lies within our midst, suggest rather the alternative, that for every man's certificate of qualification in *our* subjects he might be required to come to *our* examinations; I say "at present," for in speaking of "ourselves" and "medical men" as distinct organizations, I shall hope to be using but the language of to-day.

My subject, however, now approaches somewhat too nearly the region of pharmaceutical politics to be continued here; the arena for its discussion in detail lies elsewhere. But I sincerely hope and think that in urging it from this place to the point at which I now leave it, I have acted in sympathy with the pervading spirit of the Conference. To this extent, at any rate, I know that I must carry with me the sympathy of all its members, namely, in a warm desire to exalt the dignity of pharmacy, and in an earnest hope that we pharmacists may ever be found, as truly in fact as in aspiration, pharmacy's worthy representatives.

Mr. W. H. MALEHAM (Sheffield) said the members of the Conference were much indebted for the exhaustive address delivered by the president, Mr. Schacht, and he had great pleasure in moving a vote

of thanks to the President for his valuable address. The time was rapidly coming when they must make a stand against the attacks launched against them, and it was by such addresses that they could gain valuable information to aid them in repelling opposition.

Mr. G. W. SANDFORD seconded the motion, and observed how ardently the President loved the science he had adopted as his calling, and how anxious he was not only to elevate pharmacy but pharmacists. He could not refrain from saying, as a delegate of the Pharmaceutical Society of Great Britain, how heartily that Society appreciated the work of the Conference. It was his privilege to be connected with the Pharmaceutical Council, indeed he thought he was the president, when this Conference was established. The objects of the Conference and the objects of the Society were identical, and he thought he might congratulate the Members of the Conference on having, throughout the course of their work, done much towards elevating Pharmacy and pharmacists. Regretting that they would soon see the end of Mr. Schacht's presidency, yet hoping the same good work would continue, he must say the Pharmaceutical Conference deserved great credit for the results it had already achieved.

Mr. R. REYNOLDS, Vice-President, in putting the motion to the Conference, said it was an easy task when they were all agreed, and referred in terms of eulogy to Mr. Schacht's philosophical consideration of the position of pharmacy, and his great interest in the welfare and elevation of pharmacists.

The motion was carried unanimously.

The PRESIDENT, in acknowledging the resolution, thanked the members of the Conference for the expressions of emotion that had graced the vote, and said he was very grateful for their approval. He wished to say, however, that it must be understood that any expression of opinion on matters he had thought fit to introduce must be regarded simply as his opinion, for he should be very sorry to commit the Conference, outside those walls, to opinions which were held only by an individual. In expressing those opinions he wished rather to suggest the present position to maturer intellects, so that these questions might be pondered, not only for the benefit of pharmacists, but of the community.

The reading of papers was then proceeded with.

The first paper was a—

REPORT ON THE ACONITE ALKALOIDS.

By C. R. ALDER WRIGHT, D.Sc., LOND.,

Lecturer on Chemistry in St. Mary's Hospital Medical School.

§ 1.—ALKALOIDS OF JAPANESE ACONITE ROOTS.

In the report presented last year there were briefly described some preliminary results obtained in the examination of Japanese aconite roots. Since that date, several batches of roots have been examined with perfectly uniform results; as the numerical and other data on which these results are founded have been already published in the *Journal of the Chemical Society* (July, 1879, p. 387), it will be unnecessary to quote them here at full length.

The first batch (about $14\frac{1}{2}$ kilos of ground roots obtained from Messrs. Wright, Layman & Umney) was worked up by the reporter and Mr. A. P. Luff, by percolating with alcohol acidulated with tartaric acid (1 part of acid per 100 of roots being used in all). The percolate was condensed to a small bulk by distillation, treated with water, filtered from precipitated resin, rendered alkaline with carbonate of soda, and repeatedly shaken with ether, the ethereal solution being subsequently shaken with tartaric acid. The acid tartrate solution thus obtained free from resinous matters was then treated with soda and ether; on spontaneous evaporation a copious crop of crystals was obtained, together with a quantity of varnish-like alkaloidal matters that would neither crystallize nor yield crystalline salts.

The total yield of alkaloids from this batch was as follows:—

Soluble in ether	} crystallizable	about 12	grams = 0.08 per cent.
		25	" = 0.17 "
		—	—
		37	0.25
Insoluble in ether	} non-crystalline	20	= 0.14 "
		—	—
Total		57	0.39

The alkaloids insoluble in ether were separated by precipitating as mercuriodide, and decomposing the precipitate by sulphuretted hydrogen; they appeared to be mainly identical with the non-

crystalline alkaloid that was dissolved out by ether, being prevented from complete solution in ether by the solvent action of the soda liquors, just as is often the case with alkaline solutions of alkaloids, *e.g.* morphine and caustic potash, cotarnine and sodium carbonate.

The non-crystalline alkaloids appeared, like the similar bodies obtained by analogous means from *A. Napellus* and *A. Feroæ*, to contain a higher percentage of carbon than the crystallizable base, and to possess a lower molecular weight; on saponification with caustic potash, they yielded benzoic acid to nearly the same extent as the crystallizable base, whence it is probable that the two bodies are closely related.

The second batch of roots examined was worked up by Messrs. Hopkin & Williams in precisely the same way as the first, about a hundredweight of roots being employed. From the rough alkaloids extracted by ether, etc., and sent to the reporter for examination, about 60 per cent. was isolated as crystallizable base, and 40 as non-crystalline alkaloid.

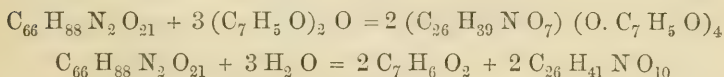
These two quantities of crystallizable base were purified by recrystallization, conversion into crystallized salts (the nitrate and hydrobromide being selected), and regeneration by soda and ether. By fractional crystallization of the different portions, attempts were made to separate the crystals into two or more portions differing from one another. No success whatever attended these efforts; in every case absolutely identical analytical numbers were yielded by the several fractions; the melting point and general properties also were invariably the same, whence it results that only one alkaloid can be supposed to be present.

The numbers obtained agreed closely with those required for the formula $C_{66}H_{88}N_2O_{21}$, and with no other. On heating the base with strong tartaric acid solution to 100° for several hours no change whatever was brought about in its composition (aconitine and pseudoaconitine become dehydrated to apo-derivatives by this treatment).

From this circumstance it appears likely that the crystallized base was already as far dehydrated as possible, either by the effect of the tartaric acid in the alcohol used for extraction or by the heat alone. Accordingly, a third batch of roots was worked up, alcohol *not acidulated at all* being employed; one hundredweight of roots was thus treated by Messrs. Hopkin & Williams, and the condensed percolate sent to the reporter, who examined it (in conjunction with Mr. A. E. Menke) as before, *i.e.*, by treating with water, filtering, adding alkali and ether, etc.

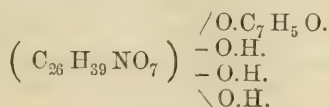
The crystallizable alkaloid obtained from this batch amounted to about 50 grams, or 0·10 per cent., the non-crystalline bases dissolved by ether being about 55 grams = 0·11 per cent. No difference whatever could be detected between the crystallized base thus obtained and the former samples, showing that if dehydration took place at all during extraction, it was brought about by the heat alone conjoined with the natural acids of the roots (the alcoholic extract was distinctly acid to test-paper). It is noticeable that the spent marc obtained in this process was percolated again by alcohol acidulated with sulphuric acid (about 30 grains of concentrated acid per gallon). This percolate, after condensation, was found to contain only between 2 and 3 grams of alkaloidal matter, of which half was non-crystalline, the other half crystallizable and identical with that above described; so that *treatment with alcohol alone, unacidulated by any acid at all, extracted practically all the alkaloids present in the roots examined.*

On examining the action of benzoic anhydride on the crystallized alkaloid thus obtained, it was found to be different from that occurring with aconitine and pseudaconitine, inasmuch as *three* additional benzoyl radicals were thus introduced into the alkaloid per C_{33} present, instead of one only. On treating the crystallized alkaloid with alcoholic potash, saponification ensued, benzoic acid being produced, and a new base very closely resembling aconine being formed. The following equations represent the actions of the benzoic anhydride and caustic potash:—

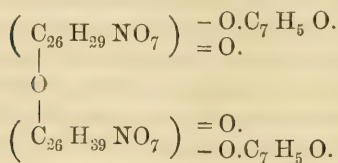


These results may be conveniently represented, in harmony with the formulæ arrived at in the previous researches on aconitine and pseudaconitine, by supposing that the roots originally contain an alkaloid, $C_{33}H_{47}NO_{12}$, differing from aconitine by containing H_4 more; and that this hypothetical parent base loses $1\frac{1}{2}$ molecules of water, producing the crystallized base above described, thus:—

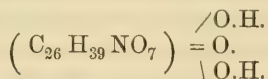
Hypothetical Parent Base.



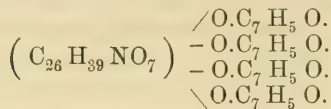
Crystallized Base above described.



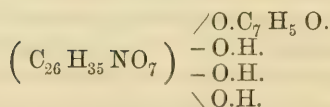
Product of the Action of Caustic Potash,



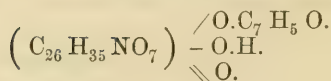
Product of Action of Benzoic Anhydride.



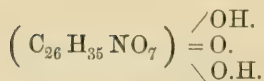
Aconitine.



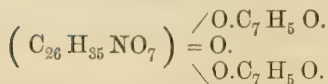
Apoaconitine.



Apoaconine.



Dibenzoylapoaconine.



As above stated, attempts to isolate this hypothetical parent base in an unaltered state did not succeed; to avoid confusion it is proposed, for the present at any rate, to designate the crystallized base, $\text{C}_{66} \text{H}_{88} \text{N}_2 \text{O}_{21}$, above described, as *japaconitine*, and the product of the action of potash upon it, as *japaconine*. It is noticeable that the

same tetrabenzoylated derivative is obtained when benzoic anhydride acts on japaconine as is formed with japaconitine itself.

Japaconitine and japaconine respectively resemble aconitine and aconine so closely that, saving by actual combustion or studying the effects of benzoic anhydride upon them, it is practically impossible to distinguish the one from the other. Japaconitine melts at 184° to 186° when purified as far as possible, the purest aconitine tested side by side melting at 183° – 184° . In physiological action the two are very closely allied, if not identical so far as the involuntary observations made whilst working with them go. Dr. Fraser, of Edinburgh, is now investigating the two bases and their derivatives in these respects.

Inasmuch as Japanese aconite roots appear to be considerably richer in crystallizable base than *A. Napellus* roots, it is evident that this class of roots is likely to be in future a valuable source of active alkaloid; further, it is evident from the above experiments that in working out the active constituents of roots of the kind, it is not necessary to acidulate the alcohol used, whereby chance of alteration during extraction is diminished.

On contrasting the results above described with those obtained two years ago (*Year-Book of Pharmacy*, 1877, 469) by Paul and Kingzett, it is open to some doubt as to whether the body obtained by those gentlemen was actually japaconitine; their analytical numbers are quite compatible with their body being either japaconitine or pseudaconitine. On the one hand, they failed to obtain any crystallized salts from their alkaloid, whilst japaconitine yields a well crystallized nitrate, hydrobromide and hydrochloride with ease, pseudaconitine only yielding a crystallized nitrate by employing a particular mode of manipulation unknown at the time Paul and Kingzett's experiments were made; this would seem to indicate, as suggested at the time by the reporter, that the base examined by them was simply pseudaconitine. On the other hand, Paul and Kingzett found that their base showed much greater tendency to crystallize than pseudaconitine, and on boiling with dilute sulphuric acid it furnished a liquid capable of reducing Fehling's solution. Whilst japaconine, like aconine, reduces Fehling's solution, pseudaconine does not do so; whence these circumstances would tend to indicate that the base isolated by Paul and Kingzett was actually japaconitine; a conclusion also in harmony with the fact that only japaconitine and no other crystallizable alkaloid of any kind was obtained from each of three different batches of roots examined by the reporter.

§ 2.—ALKALOIDS OF ATIS ROOTS (*A. heterophyllum*).

Through the kindness of Mr. E. M. Holmes, the reporter was enabled to examine the alkaloidal constituents of some 2 pounds of these roots. By percolating the coarsely powdered dry roots with alcohol containing a little tartaric acid, and evaporating the percolate, a condensed liquid was obtained containing scarcely any resin; by adding water, filtering, and shaking with ether after rendering alkaline, a small quantity of an alkaloid was extracted. This agreed very well with the description given by Broughton of *Atisine*; it was uncrystallizable, but yielded a crystalline readily soluble hydrochloride; its taste was intensely bitter without the slightest tendency to produce the tingling characteristic of the active aconite alkaloids. The quantity obtained was not quite so much as a gram (less than 0.1 per cent.), wherefore its purification was impossible, and still more was it impracticable to find out if it was a mixture of alkaloids. The following numbers were obtained on analysis of the gold salt, which formed a yellow flocculent precipitate almost insoluble in cold water. The substance examined was dried by standing several days over sulphuric acid; at 100° it fused, losing in weight and becoming apparently partially decomposed.

0.3710 gram gave 0.5175 C O₂ and 0.170 H₂ O.

0.4565 gram burnt with soda lime gave 0.00882 nitrogen by titration, 0.070 Pt. by platinum salt.

0.3970 gram gave 0.1140 Au.

These numbers are close to those required for the formula, C₂₂ H₃₁ N O₂, H Cl, Au Cl₃.

	Calculated.	Found.
Carbon	38.82	38.04
Hydrogen	4.71	5.09
Nitrogen	2.06	1.93, 2.17
Gold	28.82	28.72

Broughton deduced from his analysis of his platinum salt the formula C₄₆ H₇₄ N₂ O₅, which requires, carbon = 39.09, hydrogen = 5.38, nitrogen = 1.98, gold = 27.76, assuming the gold salt to be C₄₆ H₇₄ N₂ O₅, 2 H Cl, 2 Au Cl₃. It cannot, however, be concluded with certainty from the above experiments that his formula requires modification, owing to the minute quantity examined. *A priori* the formula, C₂₂ H₃₁ N O₂, seems somewhat more probable than his di-nitrogenous one. The alkaline fluid from which ether had extracted this base still contained a small quantity of alkaloid permanently

dissolved; on slightly acidulating with acetic acid and addition of potassium mercuriodide, a dirty yellow precipitate was thrown down.

After washing and drying over sulphuric acid—

0.432 gram gave 0.321, Ag I, iodine = 40.16.

The formula, $C_{22}H_{31}NO_2$, HI , HgI_2 , would require 41.19, whence it is very probable that the base dissolved by the soda was mainly the same as that dissolved out by the ether.

§ 3.—ALKALOIDS OF THE FLOWERS, LEAVES, AND STALK OF ACONITE.

In order to examine the nature of the alkaloids present in the aconite herbs (distinct from the roots), it was found to be necessary to wait until the present spring for fresh material. Messrs. Wright, Layman & Umney obligingly undertook to prepare the raw material, and ultimately succeeded in obtaining 300 pounds of fresh aconite herb grown at Foxton, Cambridgeshire. This was crushed under granite millstones, and the pulpy mass digested with 30 gallons altogether of methylated spirit of about 90 per cent. alcohol at the ordinary temperature for seven days, no acid of any kind being added; as much of the tincture as could be removed by draining was so recovered, and the marc pressed in cocoa-fibre bags ultimately with a pressure of 1 ton to the square inch. The total tincture was then filtered and distilled in four portions, so as to expose to heat for as short a time as possible; the residues were not completely freed from alcohol by heat for the same reason; they were united and exposed to the air in shallow pans for a night to facilitate removal of some of the remaining alcohol, and then sent to the reporter as a brown aqueous fluid smelling somewhat agreeably, not unlike treacle, the total quantity being about 59 pounds.

This material was worked up by adding soda and repeatedly shaking with ether, the ethereal solution being shaken with tartaric acid, and then used over again. From the acid tartrates thus formed, there was obtained by shaking with soda and ether an ethereal solution which did not crystallize on quick evaporation in a watch glass. These operations having only been performed within the last few days, and the reporter being on the point of leaving town, it is impossible to report to the Conference, at this meeting, what is the nature of the alkaloids present. Judging from the comparative absence of inconvenience experienced in working out

the crude alkaloid, the amount of active bases present is not large; the ethereal solution finally obtained is being abandoned to spontaneous evaporation in the hope that crystallizable bases will separate.

The author of the paper was not present, and it was read by Professor Attfield.

The PRESIDENT observed that Dr. Wright had given this subject very great attention, and had, in this last paper, arrived at much more definite conclusions.

Mr. J. WILLIAMS (London) said the most important point in Dr. Wright's investigation appeared to be the fact that he had now proved that it was no longer necessary to use acid in the preparation of aconitine, and it was proved pretty clearly that the use of acid was to be avoided. This was not known a year ago, and therefore he thought the investigation was of great practical value. He had taken practical advantage already, in a working sense, of this discovery, and finding that it was really true that acid was not required, he might say that they as pharmacists had been benefited by an amount of knowledge they had not previously possessed. With regard to the recent aconite plant, he thought it was a very interesting portion of the research, and he was surprised that no more distinct result had been obtained. He thought it went to prove that the process of separating the alkaloid to be adopted would have to be rather different to get a satisfactory result. The process of merely shaking up with ether and carbonate of soda would fail in extracting the alkaloid out of such a large bulk. The quantity of recent plant used he should have thought must have contained a large amount of alkaloid, although not so much as in the root. The plant was of a highly poisonous character, for their knowledge of the poisonous nature of aconite was not derived from the root, but the plant itself. It would have been satisfactory if Dr. Wright had been able to isolate and show them the alkaloid of the plant, and he trusted further investigation would enable him to do so.

Mr. UMNEY (London) said the great thing that had militated against Dr. Wright in his observations on the aconite plant was time. Dr. Wright had only had the extract three weeks, and he hoped they might hear something further from him on the matter. He was glad to find the deductions he had obtained from his chemical experiments confirmed what they knew, that Japanese

aconite was of excellent quality. In London large quantities had been put in the market and used almost exclusively in pharmacy, and there could be no question that it was a more powerful drug than that grown in Germany and England.

Mr. GREENISH (London) was anxious to know what kind of aconite Dr. Wright had used, for the broad term "Japanese aconite" was not very definite. It was well known that in Japan there were at least three species of aconite. He had examined many samples of Japanese aconite, and had found at least two kinds continually mixed together, one root had a round, turnip shape, as described by Hanbury in "Science Papers," and the other root was more tapering. They were evidently to his mind distinct roots. It must leave Dr. Wright's experiments in an uncertain condition until he made them from one species of aconite. These two roots mixed together in the Japanese aconite differed in character when sections were made from them. He had submitted one to Professor Flückiger, who was of opinion that Japanese aconite was not from the same species as that which was imported from Germany, the produce of *Aconitum Napellus*. In course of time it might be ascertained from what aconites these roots were produced, and it was desirable that experiments should be made on the different roots, of which there were certainly two kinds, separately. Schrott had made experiments on aconite leaves, and had arrived at the conclusion that they contained but a very small portion of the alkaloid, even if they contained any.

Professor ATTFIELD said the remarks made by Mr. Greenish were valuable, and members would like to know if he could suggest any method by which the experiments could be made on one species, and not on two or three different kinds. Unless some remedy were found, he feared they must take Dr. Wright's work as it was.

Mr. UMNEY (London) said he could not state what was the particular aconite plant from which the Japanese aconite roots that had been used, had been derived, whether *Aconitum Napellus*, *Aconitum ferox*, or *Aconitum paniculatum*; but he believed that Mr. Holmes was at the present time engaged in investigating the botanical source.

Mr. LUFF said that he had worked at the roots with Dr. Wright, and was able to state positively they only got one alkaloid from the Japanese roots, and the same alkaloid from the two batches.

Mr. GREENISH was of opinion that there would be little trouble in separating the aconites, and did not think they could arrive at a satisfactory conclusion until they knew what species were used.

If the species were separated, and the alkaloid were extracted from each species, he thought the investigators would arrive at something more definite.

The PRESIDENT, in moving a vote of thanks to Dr. Wright for his paper and able report, said he was glad to hear that the grant was not entirely expended, and consequently they might expect further communications from him on the subject.

The next paper read was the following:—

PROXIMATE ANALYSIS OF THE RHIZOME (DRIED AND DECORTICATED) OF ZINGIBER OFFICINALIS, AND COMPARATIVE EXAMINATION OF TYPICAL SPECIMENS OF COMMERCIAL GINGERS.

By J. C. THRESH, F.C.S.

Pharmaceutical Chemist.

PART I.—PROXIMATE ANALYSIS OF RHIZOME OF *Z. OFFICINALIS*.

The sample of ginger selected for analysis was a variety of what is known in commerce as Jamaica ginger. The decorticated irregular lobes were from one to two inches long, pale yellow-brown externally, and yielded a decidedly brown powder; fracture slightly resinous. Preliminary experiments led me to the conclusion that it would be best to treat the powder with the following solvents, in the order given:—ether, water, rectified spirit, 1 per cent. soda solution, 1 per cent. hydrochloric acid.

As the constituents soluble in ether were known to be those most worthy of investigation, I got Mr. Umney to exhaust 28 lbs. of the ginger with ether, to distil off the solvent, and forward me the extract and the marc. This extract was of a deep red-brown colour, semi-fluid consistency, and had the strong characteristic odour and pungent taste of ginger. It dissolved readily and completely in ether, alcohol, chloroform, and benzol, required a rather large proportion of 84 per cent. alcohol for complete solution, was imperfectly soluble in glacial acetic acid, and but slightly soluble in petroleum ether.

A part of the ethereal extract was agitated first with water, then with successive portions of petroleum ether, until the solvent came off nearly colourless. After being treated a great number of times with this ether, the residue continues to impart to it both a slight colour and pungency, hence it was not deemed advisable to con-

tinue the treatment more than three or four times. The solution was of a deep red colour and very pungent. Upon allowing the petroleum ether to evaporate spontaneously, a quantity of deep red, apparently crystalline, fatty matter was deposited. This was removed by filtration, washed with a little petroleum ether, and pressed between folds of bibulous paper. Let this be called "crystalline fatty matter."

The fluid which had passed through the filter was exposed to a current of warm air until the last trace of the petroleum ether* was removed, then placed in a flask and a current of steam passed through it, and condensed so long as any volatile oil came over. The residue in retort consisted of a transparent red fat, about the consistence of lard. Call this "red fatty matter."

The residue of ethereal extract, insoluble in petroleum ether was of semi-fluid consistency, of a red-brown colour, with a scarcely perceptible odour, but intensely pungent taste. It dissolved readily in absolute and 84 per cent. alcohol, but when treated with 50 per cent. alcohol a residue was left which after washing with several successive quantities of alcohol of this strength, finally yielded nothing further to the solvent. This substance was of resinous consistency, nearly black in colour, and quite tasteless. "Neutral resin."

The dilute spiritous solution when evaporated left a soft transparent red-brown residue, which although I soon found evidence of its compound nature, has proved most troublesome to resolve into its proximate constituents. It dissolved readily in benzol, bisulphide of carbon, glacial acetic acid, dilute alcohol, and alkaline solutions. Its alcoholic solution precipitated most copiously with neutral and basic lead acetates, milk of lime, and baryta water. In each case the precipitate first thrown down by the reagent differed in colour from the portion precipitated afterwards. In the former case the precipitate was a pale orange-brown, in the latter orange-yellow, and the supernatant fluid after addition of excess of the precipitate was exceedingly pungent, and much paler in colour than the original solution. A quantity of the tincture was shaken with successive portions of slacked lime so long as anything was carried down, and the lime precipitate removed by filtration. After repeated washings with spirit it still retained some pungency, and when treated with hot spirit, what was previously a soft, sticky, flocculent precipitate fused into a semi-transparent mass, which adhered tenaciously to the sides of the flask. This was digested in alcohol and sufficient

* The petroleum ether employed boiled at 50° C.

sulphuric acid added to completely decompose it, excess of acid removed with baryta, the solution filtered, and evaporated to dryness. The residue was a dark brown-black, brittle solid, possessed of a slightly pungent taste, but no odour. "Acid resins."

The 50 per cent. alcohol solution from which the resins had been removed by lime, when acidified with sulphuric acid gave an abundant precipitate of sulphate of lime, indicating the presence of a lime salt in the solution. This fluid was carefully freed from excess of sulphuric acid, filtered, and evaporated to dryness. The residue was semi-fluid, transparent, pale red, and intensely pungent. "Active principle."

There remains now to examine further—

1. Crystalline fatty matter.
2. Red fatty matter.
3. Volatile oil.
4. Neutral resin.
5. Resinous acids.
6. Active principle.

1. *Crystalline Fatty Matter*.—This had a slightly pungent taste, which, however, was easily removed by treatment with 84 per cent. alcohol, which when cold did not appear otherwise to affect the residue. Boiled with spirit, and filtered hot, the filtrate deposited voluminous flakes of brownish colour. The portion insoluble in 84 per cent. alcohol was a soft red fat, which has resisted all efforts to resolve it into simple constituents, and hence may be regarded as a proximate constituent of the ginger rhizome.

(a.) *Soft Red Fat*.—Properties: transparent, dark red, tasteless, and odourless. Soluble in alcohol, petroleum ether, ether, benzol, carbon disulphide, and turpentine. Very slightly soluble in 84 per cent. alcohol, and forming with solution of potash an imperfect soapy solution. Not further examined.

The brownish flocculent matter deposited by the spirit upon cooling, when collected and placed on a water bath, shrivelled up to an exceedingly small residue, of a pale brown colour and waxy consistency. I at first regarded this as a kind of wax, but when purified by being a great number of times dissolved in hot alcohol, and re-deposited on cooling, a very small quantity of a snow white amorphous substance remained.

(b.) *White Amorphous Substance*.—White, amorphous, pulverulent, odourless, and tasteless. Heated on the mercurial bath to 250° C., it did not fuse, but began to exhibit a slight brown coloration. At a higher temperature it becomes darker in colour, melts and evolves

inflammable vapours which burn with a luminous smokeless flame, emitting no characteristic odour. It is insoluble in water, acid or alkaline solutions. Its behaviour with other solvents is somewhat peculiar. Cold ether dissolves it very sparingly, but in boiling ether it is more soluble, depositing the excess as the fluid cools in a granular form. Benzol and carbon disulphide dissolve it rather more freely, and the solutions when left to evaporate spontaneously become covered with a transparent gelatinous film, which increases in thickness as the evaporation continues, until at length the residue is wholly of this consistence, and the vessel may be upturned without losing any of the contents. If the evaporation be now continued on the water bath, the bulky mass dwindles away, leaving a very slight residue. From boiling absolute alcohol it is deposited in granular waxy-looking masses upon the side of the containing vessel. From boiling rectified spirit, if saturated, it is deposited in the gelatinous or bulky form, the whole becoming semi-solid, and resembling in appearance a strong solution of an aluminium salt to which ammonia has been added. Boiling glacial acetic acid takes up a small portion, and deposits it upon cooling or dilution in the gelatinous condition.

(c.) *Resin δ*.—The wax-like appearance of the crude substance (b) is due to the presence of a hard, brittle, fusible resin, which I have not isolated in the pure state. It appears to be but slightly soluble in alcohol, but soluble in petroleum ether, benzol, carbon disulphide, and turpentine. It is tasteless and odourless.

2. *Red Fatty Matter*.—This portion of the ethereal extract was very pungent, but when treated with successive portions of 50 per cent. alcohol, the pungent principle passed into the alcohol, together with other substances which upon further examination proved to be identical with those contained in the alcoholic solution of the ethereal extract, which had been treated with petroleum ether. Besides these (gingerol, resins α and β) there was the red fat already described, and traces of resin, and of the white amorphous substance.

3. *Volatile Oil*.—This is the only constituent of the ginger root hitherto examined, and the statements concerning it are somewhat conflicting. Gmelin says that its colour is yellowish, Neumann that it is red, and Morin affirms that it is greenish-blue. Paponsek (*Wien. akad. Ber.* 9, 315), who submitted the oil to chemical examination, obtaining the formula $C_{10}H_{16}H_2O$, states that it has a strong odour of ginger, and a burning aromatic taste; Bucholz, on the contrary, asserting that its taste is "rather mild at first, but

somewhat bitter and biting after." Time has only allowed me to note the following physical and other properties of the oil obtained in the manner previously described.

It is a limpid, straw coloured fluid, with a peculiar aromatic odour, by no means recalling that of the rhizome from which it was prepared, and of an aromatic and somewhat camphoraceous taste. Sp. gr. '853 at 15° C. (Hanbury and Flückiger in "Pharmacographia," '878; Paponsek, '893). It is neutral in reaction, forms no compound with sodium bisulphite, and is very soluble in absolute alcohol, benzol, petroleum ether, ether, and bisulphide of carbon.

One part of the oil dissolves in 25 of alcohol (sp. gr. '815), in 50 parts of alcohol (sp. gr. '834), but requires about 600 to 700 parts of alcohol of sp. gr. '920. These approximations were obtained by adding with agitation alcohol of the above strengths, to 1 c.c. of the volatile oil contained in a flask, until a clear solution resulted. Dropped upon dry powdered iodine, instantaneous reaction takes place, accompanied by evolution of heat and effervescence. A few drops digested with a fragment of sodium produced a slight effervescence which continued for several days, the ultimate product being much darker in colour, and very viscid. The strange difference between the odour of the oil as it exists in the ginger and as obtained by distillation accounts for the statement made by Mr. Draper at the last conference, that "an essence prepared from oil of ginger did not give the same results as that obtained from ginger itself." A sample of this oil, obtained from a London firm who import it from Germany, is identical in colour, odour, and taste with that prepared by myself, but its specific gravity is '907. A sample of oil obtained from an ethereal extract which had lost a great portion of its volatile oil from too long exposure to steam heat in the retort had a slightly darker colour and a specific gravity of '874. Hence it appears most probable that the oil of ginger really contains two or more volatile oils, differing in specific gravity, boiling point, etc.

4. *Neutral Resin*.—This is the most abundant constituent of the ethereal extract, and, after treatment with 50 per cent alcohol, remains as an odourless and tasteless, brittle, but somewhat soft, resin, slowly taking the form of the vessel in which it is kept. Its colour by reflected light is nearly black, but by transmitted light, if viewed in thin layers, it appears transparent and of a dark red-brown colour. It dissolves readily in absolute alcohol, ether, benzol, carbon disulphide, and turpentine. In rectified spirit it dissolves slowly but somewhat freely, but is almost totally unaffected by proof spirit and petroleum ether. Glacial acetic acid dissolves it,

but it is only slightly acted upon by solutions of potash, soda, or ammonia. The alcoholic solution is neutral to test paper.

5. *Acid Resins*.—This portion of the original extract evidently contained, as before stated, at least two resins, besides traces of the active principle, and possibly also of an oxidation product of the essential oil. When treated with benzol or carbon disulphide it separated into two portions, the one taken up by the solvent, the other unaffected by it. This residue, after being treated repeatedly with benzol and carbon disulphide until nothing further was dissolved, I have called Resin *a*.

Resin a.—As above obtained is a dark brown rather soft solid, breaking with a short resinous fracture, readily soluble in dilute alcohol, ether, and chloroform; but almost entirely insoluble in benzol, carbon disulphide, and turpentine. Glacial acetic acid dissolves it freely, as also does solution of potash, the fluid becoming of a dark brown colour. The alcoholic tincture gives a pale brown precipitate with both acetate and subacetate of lead. It does not dissolve in liquor ammoniæ, and is precipitated from its solution in potash by addition of ammonium chloride. The alcoholic solution is neutral to test paper.

Boiled with absolute alcohol and sodic carbonate the solution becomes of a dark brown colour, and sodium is readily detected in it. Hydrochloric acid does not affect the resin; sulphuric acid forms with it a brown solution which is decolorized by addition of potassium bichromate; nitric acid gives a brown solution which evolves nitrous fumes and becomes orange-red.

The benzol solution of No. 5 was very pungent in taste, and when the benzol had been removed by evaporation, and the semi-fluid residue dissolved in rectified spirit, addition of basic lead acetate gave a copious precipitate; but when the precipitant was added very gradually, it was noted that the colour of the precipitate varied from an orange-brown to an orange-yellow. By fractional precipitation, decomposition of the orange-yellow lead salt, re-solution of the resulting resin in alcohol, and re-precipitation (partial) by subacetate of lead, a compound of lead and resin was obtained, from which the resin was finally extracted.

Resin β.—In external appearance, consistency, etc., it closely resembles resin *a*; like it also it is readily soluble in dilute alcohol, ether, chloroform, glacial acetic acid, and solution of potash; but it differs from resin *a* in being soluble in benzol, bisulphide of carbon and turpentine, and in giving an orange precipitate with subacetate of lead and a deep orange solution with liquor potassæ. It does

not dissolve in ammonia, is tasteless and odourless, and in alcoholic solution has a barely perceptible acid reaction.

Dissolved in absolute alcohol and boiled with sodium carbonate, the solution assumes an orange-red colour, and contains sodium. By action of hydrochloric, nitric, and sulphuric acids it can scarcely be distinguished from resin α .

The alcoholic solution from which the resins α and β had been removed by lime yielded upon evaporation, etc., as before stated, a reddish, thick, oily-looking substance, which was intensely pungent in taste. This was dissolved in as small a quantity as possible of 50 per cent. alcohol, and shaken with a little lime, whereby more of the resins α and β were removed. When neutralized with sulphuric acid, filtered, and evaporated, the residue was found to be much paler than before, but when dissolved in liquor potassæ it still gave a rich orange coloured solution. It undoubtedly contained traces of resin β , to remove which is an exceedingly difficult matter. It can, however, be accomplished by boiling the impure substance (which I have called gingerol) in petroleum ether, and rapidly decanting. The ether as it cools deposits the gingerol in oily drops. By treating the crude substance several times with the same ether, collecting the still slightly impure principle, and subjecting it to a repetition of the above treatment, the pure or very approximately pure gingerol is obtained. Only the portions first taken up by the petroleum ether are employed (as by repetitions of the treatment the whole of the impure substance can be dissolved); hence the product of pure gingerol is small.

Gingerol.—This, which is the pungent or active principle of ginger, is a viscid fluid of about the consistency of treacle, of a pale straw colour, entirely devoid of odour, and of an extremely pungent and slightly bitter taste. It is very soluble in alcohol (even when diluted to 50 per cent.), benzol, volatile oils, carbon bisulphide, solutions of potash and ammonia, and glacial acetic acid. It is very slightly soluble in petroleum ether. The alcoholic solution is neutral in reaction, and gives no precipitate with the acetates of lead nor with lime. It does not yield glucose when treated with dilute sulphuric acid; strong sulphuric acid dissolves it with production of a brown colour; hydrochloric acid does not affect it; nitric acid converts it into a blood-red resinous substance. The specific gravity of a slightly impure specimen was 1.09 at 15° C.

Aqueous Solution of Ethereal Extract.—Upon evaporation this deposited a considerable amount of soft resinous matter; was acid in reaction and pungent in taste. It contained considerable traces

of an alkaloid, malic acid, and other substances, found in aqueous extract of the rhizome.

A second lot of ethereal extract was treated in a somewhat different manner. The whole was placed in a flask, and the essential oil carried off by a current of steam. The residue was then treated first with petroleum ether, and afterwards with proof spirit. What remained was completely soluble in benzol, but upon addition of a little petroleum ether the fluid separated into two distinct layers. The lower and darker coloured was removed, and more benzol and petroleum ether added to it, and the lower layer again removed. This residue was now found to consist almost entirely of resin α , and after treatment with successive portions of benzol to remove traces of gingerol and resin β , pure resin α remained. The benzol and petroleum ether solution, when shaken with slightly diluted alcohol (about 75 per cent.), yielded up nearly all the gingerol, together with a part of the resins. Upon repeating this treatment the active principle contained still less of the resins, and was further purified by treatment with petroleum ether, as before described. The gingerol and resin α thus obtained are identical with those obtained by treatment with lime, decomposition of lime salt by acid, etc. Resin β can only be obtained by evaporating off the benzol and petroleum ether from solution which has been treated with spirit, dissolving residue in dilute alcohol, fractional precipitation with lime, etc.

Aqueous Extract of Ginger.—The ginger, or rather a portion of the ginger, which had been exhausted with ether, was macerated for a couple of days in sufficient cold water to cover it, then transferred to a percolator, and water passed through until the marc was exhausted. The first portion of the percolate had an acid reaction, was limpid, and of a pale brown colour. It was carefully evaporated upon the water bath to a small bulk, a pellicle constantly forming upon the surface, which readily dissolved when the fluid was stirred. This solution gave with ammonia a copious crystalline precipitate, which, when removed by filtration, proved to be almost pure ammonio-magnesium phosphate. Both mineral and organic acids gave a flocculent, very voluminous flesh-coloured precipitate, which only re-dissolved in large excess of mineral acid. Both acetates of lead gave bulky precipitates, as also did admixture with alcohol. The concentrated solution was mixed with three volumes of 85 per cent. alcohol, and after standing some time the precipitate was removed by filtration, and washed with a little alcohol. When now diffused in warm water, only part dissolved, a beautifully white crystalline powder remaining behind. This was separated and

washed, and proved to be almost pure phosphate of magnesia, but contained traces of manganese, potassium, iron, calcium, and oxalic acid. The aqueous solution derived from the alcoholic precipitate, when mixed with a little acetic acid, gave a voluminous precipitate, and the filtrate, when mixed with alcohol, gave a further precipitate (mucilage or gum). From the filtrate the alcohol was removed at a gentle heat, and to the solution acetate of lead was added. This gave a brownish coloured precipitate, a part of which dissolved in boiling water, and was re-deposited in an indefinitely crystalline form upon cooling. The fawn-coloured crystalline mass was diffused through water and decomposed by sulphuretted hydrogen. The resulting acid, when neutralized, gave no precipitate with calcium chloride until alcohol was added, and was apparently malic acid associated with a little impurity. The lead salt, when ignited, left a residue of lead oxide somewhat under the normal amount. The portion of lead precipitate not dissolved by boiling water yielded but little to acetic acid, and the residue was phosphate of lead together with a little oxalate and brown, humus-like matter. The aqueous infusion which had been treated with neutral lead acetate was rendered slightly alkaline by ammonia and excess of basic lead acetate added; the precipitate which fell was not further examined. The excess of lead was removed from the liquid by H_2S , and the excess of H_2S got rid of by warming the solution whilst exposed to a current of air. When rendered alkaline, tannin produced a most abundant precipitate, and phosphomolybdate of ammonia, Nessler's reagent, and iodine, gave indications of the presence of an alkaloid, but not in sufficient amount to warrant an attempt at its isolation. The tannin precipitate was collected, washed, dried, rubbed with lead oxide and rectified spirit, and digested at a gentle heat for several hours. The resulting solution, when evaporated, left a residue, which I will call "indifferent substance precipitated by tannin."

The original infusion did not reduce Fehling's solution.

Acidified with acetic acid and filtered, $CaCl_2$ gave a precipitate which readily dissolved in hydrochloric acid. Evaporated to a small bulk, traces of Ca and Mg removed, then acidified with hydrochloric acid and perchloride of platinum added, abundant evidence of the presence of potassium was obtained. These reactions, together with the acid character of the infusion, lead me to infer that the binoxalate of potash is a normal constituent of ginger rhizome. The substance precipitated by acids, mucilage, and indifferent principle precipitated by tannin, were submitted to such further examination as my limited time allowed.

Substance Precipitated by Acids.—This substance, when obtained, together with mucilage, by precipitating an infusion of ginger with alcohol, easily dissolves in pure water; when obtained by addition of an acid, it is not so readily soluble. Solutions of potash, soda, and ammonia dissolve it, and when an acid is added it is reprecipitated. When washed with a little water, and dried, the residue is transparent, reddish, very brittle, and readily reduced to a red-brown powder. It dissolves in strong hydrochloric, nitric, and sulphuric acids, the hydrochloric solution, after some time, acquiring a purplish yellow tint; the nitric solution is bright yellow; the sulphuric solution is similar in colour to that in hydrochloric acid. In each case dilution with water causes precipitation of the original substance. When burnt upon a platinum dish, it swells up considerably, leaving a voluminous char, which burns away with difficulty, leaving a little slightly-coloured ash, which appeared to be chiefly $\text{Mg}_3\text{P}_2\text{O}_4$.

·4200 gram yielded ·0105 ash, or 2·5 per cent.

A little of the dried substance, when fused with sodium in a test-tube, and the resulting mass treated successively with solution of oxidized ferrous sulphate and hydrochloric acid, gave a copious precipitate of Prussian blue. ·651 gram, when burnt with soda lime, yielded ·135 gram of double chloride of platinum and ammonium, corresponding to 1·3 per cent. of nitrogen. (This substance is probably a mixture of albuminoid and arabinoid bodies.)

Mucilage.—This is precipitated by alcohol, after the nitrogenous substance has been removed by addition of acetic acid and filtration. When dried it is an amorphous, gum-like mass. As precipitated from a strong aqueous infusion of the ginger, it contained 25 per cent. of mineral salts (chiefly $\text{Mg}_3\text{P}_2\text{O}_8$ and $\text{KH}_2\text{C}_2\text{O}_4$); as obtained from a more dilute solution, it yielded 13 per cent. of ash. It is soluble in water, forming a slightly mucilaginous solution, which is not affected by solution of borax, precipitates slightly with neutral lead acetates, ferric chloride, and mercuric chloride (probably only oxalate and phosphates), and solidifies (in concentrated solution) upon addition of basic lead acetate. After boiling some time with dilute sulphuric acid, the product reduces Fehling's solution. No blue colour is exhibited when moistened with iodine and sulphuric acid.

Indifferent Substance Precipitated by Tannin.—The matter precipitated by tannin was left as a pale brown amorphous residue upon evaporation of the tincture obtained by digesting the tannic precipitate with carbonate of lead. It did not reduce Fehling's solu-

tion after treatment with dilute acid. Its aqueous solution gave indications of the presence of an alkaloid with the phosphomolybdic, metatungstic, iodine, and Nessler's reagents, but it was evident that this existed in it only in minute proportion. From its aqueous solution tannin only precipitated it after addition of an alkali.

Alcoholic Extract.—A portion of the powdered ginger which had been treated with ether and water was next percolated with 84 per cent. alcohol. The percolate was of a very pale red colour, and when evaporated left an exceedingly small residue of a resinous character. It was insoluble in water or dilute acids, soluble in alkaline solutions, absolute and diluted alcohol. Did not affect Fehling's solution after treatment with acid. Not further examined.

The marc insoluble in ether, water, and alcohol, was digested in 1 per cent. soda solution for several days. The infusion was mucilaginous; it filtered with very great difficulty, the filtrate being opalescent. Neutralized with acid, only a very slight turbidity was produced; but upon addition of 3 volumes of 95 per cent. alcohol, a very voluminous, white, flocculent, precipitate fell, which rapidly cohered into lumps, leaving the supernatant fluid perfectly clear.

Metarabin.—The substance, as above isolated, appeared to be an insoluble variety of gum, it was free from colour, and when dried left a brittle, slightly coloured residue. It contained a barely detectable trace of nitrogenous matter, and left upon ignition 5 per cent. of ash. It dissolved readily in alkalis, but very slightly, if at all, in strong hydrochloric acid.

The alkaline solution (together with the marc) was diluted, boiled (to dissolve and remove the starch), and the insoluble residue washed by subsidence and decantation, boiled and digested with a 1 per cent. hydrochloric acid. The infusion, when filtered and neutralized, became slightly turbid, and upon admixture of alcohol a flocculent precipitate was formed. This, which appeared to be a parabin, or a closely allied body, yielded upon incineration nearly 20 per cent. of ash, chiefly calcium oxide (but possibly also a little phosphate), derived from the calcium oxalate contained in the rhizome.

The quantitative analysis of the rhizome, the result of which will be found tabulated with those obtained upon examination of typical examples of commercial ginger, and given at end of Part II. of this paper, was made in a similar manner to that detailed in Part I., but not upon same quantities of ginger. The percentage of ethereal extract and of its constituents is calculated from amounts yielded by 28 pounds of powder, and the other constituents from 10 grams only. The total oxalates derived from analysis of a hydro-

chloric infusion, by precipitation with calcium chloride, after addition of excess of an alkaline acetate, correspond to 1.52 per cent. of oxalic acid. The phosphoric acid, as determined in solution from which the oxalate has been removed, equalled .7 per cent.

Appended is a tabulated statement of the action of the various solvents, etc., upon the constituents of the ethereal extract:—

Name.	Alcohol.	Petroleum Ether.	C S ₂ .	Benzol.	Essential Oil.	KHO Solution.	Glacial Acetic Acid.	Physical Properties.
Volatile Oil	Sol.	Sol.	Sol.	Sol.	Sol.	Insol.	Sol.	Straw coloured, limpid, not pungent in taste.
Amorphous Substance	Sol.*	Sol.*	Sol.*	Sol.*	Sol.*	Insol.	Sol.*	White amorphous.
Red Fat	Sol.*	Sol.	Sol.	Sol.	Sol.	Forms soapy sol.	Insol.	Deep red transparent fat.
Resin δ	Sol.	Sol.	—	—	—	—	—	—
Neutral Resin	Sol.†	Insol.	Insol.	Sol.	Sol.	Insol.	Sol.	Black, pitch-like resin.
α Resin	Sol.	Insol.	Insol.	Insol.	Insol.	Sol., deep brown	Sol.	Odourless and tasteless, soft but brittle resin.
β Resin	Sol.	Sol.*	Sol.	Sol.	Sol.	Sol., orange red	Sol.	Odourless and tasteless, soft but brittle resin.
Gingerol	Sol.	Sol.*	Sol.	Sol.	Sol.	Sol.	Sol.	Straw coloured, viscid, odourless fluid; taste extremely pungent.

* Slightly soluble.

† Insoluble in proof spirit.

PART II.—COMPARATIVE EXAMINATION OF THE GINGERS OF COMMERCE.

For the above purpose Mr. Umney kindly selected for me a typical specimen of each of the varieties found in commerce, viz., Jamaica, Cochin, and African.

No. 1. Jamaica ginger. A fine B. P. specimen. Irregularly lobed decorticated pieces, three or four inches long, sub-compressed, yellowish white, but not chalky on surface. Fracture short, mealy. Powder yellowish white.

No. 2. Cochin ginger. Irregularly lobed pieces, decorticated, two or three inches long, a little smaller than the Jamaica, and pale brown externally. Fracture fibrous, short. Powder yellowish white.

No. 3. African ginger. Short irregular coated lobes, of a brown colour. Fracture short, rather resinous. Powder brown.

Moisture and Volatile Oil.—A quantity of each of the above was reduced to powder, and small weighed portions placed in tared dishes on the water bath, until they ceased to lose weight and no longer retained an odour of ginger.

No. 1.	1.652	grams lost	.234	or	14.17	per cent.
„ 2.	1.311	„ „	.195	or	14.88	„
„ 3.	1.476	„ „	.235	or	16.13	„

Ash.—The above quantities were burnt at a dull red heat, cooled in dry air, and rapidly weighed.

No. 1	yielded ash weighing	.059	or	3.57	per cent.
„ 2	„ „	.063	or	4.80	„
„ 3	„ „	.063	or	4.27	„

Ethereal Extract.—Twenty grams of each were packed in small percolators, and ether passed through to exhaustion. For this purpose the African required twice as much of the solvent as the Jamaica and Cochin. The ether was driven off at a low temperature, and the residue kept on water bath until the loss of weight between consecutive weighings at short intervals was trifling.

No. 1	extract weighed	.658	grams.
„ 2	„ „	.993	„
„ 3	„ „	1.613	„

Volatile Oil.—The above residues were kept for eight to ten hours upon a chloride of calcium bath, until they no longer lost weight.

No. 1	extract lost	.150	=	.75	per cent. volatile oil.
„ 2	„ „	.270	=	1.35	„ „
„ 3	„ „	.323	=	1.61	„ „

A second determination of above was made by treating fresh portions of the powdered ginger with petroleum ether (boiling at 50° C.), removing ether by first, a current of air, and second, exposure for a few minutes to a temperature of 100° C. The extracts were then kept at about 115° C. until the weights were constant.

No. 1	gave results corresponding to	.830	per cent. volatile oil.
„ 2	„ „	1.14	„ „
„ 3	„ „	1.97	„ „
„ 4	„ „	1.38	„ „

No. 4 was the sample used in investigation of proximate constituents of ginger. The amount of volatile oil actually obtained from 28 lbs. of this ginger was, as before stated, 5½ ozs., or 1.23 per cent., and as this was undoubtedly not the whole of the oil contained in the ethereal extract, the above determinations may be taken as close approximations.

Deducting the volatile oil, from the moisture + volatile oil, we have—

Moisture in No. 1	.	.	.	.	13.42 per cent.
" " 2	.	.	.	.	13.53 "
" " 3	.	.	.	.	14.515 "

Soft Fat, Resin δ , and Wax (?).—The ethereal extracts were next treated with small portions of petroleum ether to extract the fat, etc., the ether driven off, the residues washed with a little proof spirit, dried and weighed.

No. 1 yielded	.	.	.	.	.140 gram, or .7 per cent.
" 2 "	.	.	.	.	.241 " or 1.2 "
" 3 "	.	.	.	.	.245 " or 1.22 "

Neutral Resin.—The residues insoluble in petroleum ether were exhausted with proof spirit, and the washings of petroleum ether extracts added thereto. The portions insoluble in proof spirit consisted of the neutral resin, which was dried and weighed.

No. 1 weighed	.	.	.	.	.173 gram = .865 per cent.
" 2 "	.	.	.	.	.190 " = .950 "
" 3 "	.	.	.	.	.461 " = 2.305 "

Gingerol.—The above proof spirit solutions were precipitated with basic lead acetate, filtered, evaporated, and residue washed with dilute acetic acid, dried and weighed. This residue consisted of the active principle with traces of resins α and β . The lead precipitate retained traces of active principle, so that these determinations, gingerol and resins α and β , are mere approximations.

No. 1 yielded	.	.	.	.	.132 gram, or .66 per cent.
" 2 "	.	.	.	.	.120 " or .60 "
" 3 "	.	.	.	.	.290 " or 1.45 "

Resins α and β .—Calculated by difference we have from—

No. 1	.	.	.	.	.063 gram, or .315 per cent.
" 2	.	.	.	.	.172 " or .860 "
" 3	.	.	.	.	.294 " or 1.470 "

Aqueous Extract.—The portions of the original gingers insoluble in ether were dried and mixed with water until each measured 400 c.c. The mixtures were stirred at frequent intervals for several days, the insoluble portions then allowed to subside, 20 c.c. (= 1 gram ginger) of the clear supernatant fluid removed from each, evaporated to dryness and weighed, and the ash afterwards ascertained by ignition and re-weighing.

No. 1 gave	.143	gram extract,	less	.023	gram ash	=	12.0	per cent.
" 2 "	.146	"	"	.025	"	"	=	12.1 "
" 3 "	.105	"	"	.030	"	"	=	7.5 "

Substance Precipitated by Acids.—Other portions of 100 c.c. each (= 5 grams ginger) were acidified with acetic acid, allowed to stand for a few hours, then warmed, and filtered through tared filters, the precipitates washed with a little dilute acid, dried and weighed.

No. 1	yielded	·266	gram,	less	ash	·0035	gram	=	5·25	per	cent.
„ 2	„	·262	„	„	„	·0045	„	=	5·35	„	„
„ 3	„	·235	„	„	„	·005	„	=	4·60	„	„

Mucilage.—The acid filtrate and washings from above were evaporated to 20 c.c., and mixed with 60 c.c. of 95 per cent. alcohol. (In each case during the evaporation a little flocculent matter was deposited, but the amount was too small to materially affect the estimations.) The mixtures were set aside for the day, the precipitates then thrown upon tared filters, washed with a little alcohol, dried and weighed, and the ash afterwards determined and deducted.

No. 1	yielded	·1725	gram,	less	ash	·053	gram	=	2·39	per	cent.
„ 2	„	·1155	„	„	„	·043	„	=	1·45	„	„
„ 3	„	·097	„	„	„	·038	„	=	1·19	„	„

Organic Acids, etc.—The combustible portion of aqueous extract unaccounted for consisted of malic (?) and oxalic acids, an indifferent substance precipitated by tannin, and possibly other bodies. Of these the following percentages were obtained :—

No. 1	.	.	.	.	.	.	4·36	per	cent.
„ 2	.	.	.	.	.	.	6·80	„	„
„ 3	.	.	.	.	.	.	1·70	„	„

Alcoholic Extract.—The mares insoluble in ether and water were drained upon filters, re-packed in the percolators, and 84 per cent. alcohol passed through so long as anything was dissolved. (200 c.c. in each case.) The Jamaica and Cochin tinctures had a pale amber tint, the African a pale brown. 40 c.c. of each were evaporated to dryness and the residue weighed.

No. 1	gave	.	.	.	.	.	·016	gram,	or	·4	per	cent.
„ 2	„	.	.	.	.	.	·011	„	or	·28	„	„
„ 3	„	.	.	.	.	.	·025	„	or	·625	„	„

The residues from treatment with ether, water, and alcohol were next digested in sufficient 1 per cent. soda solution to measure 400 c.c. The Jamaica ginger yielded a mucilaginous solution, in which the insoluble matter settled very slowly; the Cochin ginger gave but a slightly mucilaginous solution, whereas the African variety yielded a perfectly limpid infusion. 50 c.c. (= 2½ grams ginger)

were neutralized with acetic acid mixed with 100 c.c. of 95 per cent. alcohol, and allowed to stand for a day. The precipitates were then collected on tared filters, washed, dried, weighed, then ignited and the ash estimated.

No. 1	yielded	·731	gram,	ash	·029	gram	=	28·08	per cent.
„ 2	„	·210	„	„	·007	„	=	8·12	„
„ 3	„	·049	„	„	·0015	„	=	1·86	„

Starch.—The remainder of the alkaline infusions were in each case diluted to 1200 c.c., boiled for a few minutes, allowed to cool to 50°, and digested at the latter temperature for forty-eight hours with a little diastase. 50 c.c. were then taken and boiled with 8 c.c. of dilute sulphuric acid (1 in 8) until the fluid ceased to react with iodine, or the volume was reduced to 50 c.c. After cooling the solutions were each run into 10 c.c. of Fehling's solution (= ·044 gram starch), until the blue tint disappeared.

No. 1	required	14·9	c.c.	=	·044	gram	starch,	or	18·12	per cent.
„ 2	„	17·1	„	=	·044	„	„	or	15·79	„
„ 3	„	20·	„	=	·044	„	„	or	13·50	„

Pararabin and Calcium Oxalate.—The residues insoluble in caustic soda and boiling water were slightly washed by subsidence and decantation, and mixed with sufficient 1 per cent. hydrochloric acid to measure each 400 c.c. After macerating twenty-four hours, they were boiled for a few minutes, and 50 c.c. (= 2½ grams ginger) of each, filtered, neutralized with ammonia, and diluted with three volumes of 95 per cent. alcohol. The addition of ammonia to the Jamaica infusion caused a slight turbidity; the Cochin infusion was not affected, but a rather bulky brown gelatinous precipitate was produced in the African solution. The ammonia and alcohol precipitates were collected on tared filters, dried, and weighed, then incinerated and the ashes weighed. The ashes from the Cochin and Jamaica gingers consisted of Ca O derived from the calcium oxalate in acid solution; the African ash was of a brown colour, and contained manganese.

No. 1.	Pararabin and Calcium Oxalate,	·025	gram	=	1·00	per cent.
„ 2.	„	„	„	·374	„	= 14·96 „
„ 3.	„	„	„	etc., ·273	„	= 10·92 „

The ash of No. 1 weighed ·010 = ·914 per cent. of calcium oxalate.

The ash of No. 2 weighed ·006 = ·580 per cent. of calcium oxalate.

The ash of No. 3 weighed ·085, but of this only ·022 was Ca O, equivalent to 2·04 per cent. Ca C₂ O₄. Deducting the proportions of

this salt from the result of last experiment, we have the yield of pararabin in—

No. 1	.	.	.	.	.	.	·086 per cent.
„ 2	.	.	.	.	.	.	14·40 „
„ 3	.	.	.	.	.	.	6·36 „

(the ash not Ca O also being deducted.)

Cellulose.—The mares from treatment with dilute acid were digested for several days, with constant agitation, in nitric acid of sp. gr. 1·16, to which a little powdered potassium chlorate had been added. The insoluble portions, which were nearly colourless, were washed successively with water, dilute ammonia, and alcohol, then dried and weighed.

No. 1 yielded	.	·7 gram Cellulose	=	3·5 per cent.
„ 2 „	.	·75 „ „	=	3·7 „
„ 3 „	.	1·25 „ „	=	6·25 „

Albuminoids.—Portions of the original gingers in powder were burnt with soda lime, as in Will and Varentrapp's method, and the ammonia estimated as double chloride of platinum and ammonium. As the precipitates were rather dark in colour, one of them was ignited, and the platinum weighed. The results were closely concordant.

1·069 gram No. 1 yielded	·245 gram Pt. Salt	=	1·38 per cent. N.
1·360 „ „ 2 „	·193 „ „	=	·891 „
1·130 „ „ 3 „	·094 „ „	=	·522 „

In a second determination of the No. 1,

·833 gram yielded ·211 gram Pt. Salt = 1·44 per cent. N.

Taking one part of nitrogen as representing 6·25 parts of albuminoids, and neglecting to take into consideration the small percentage of nitrogen in the substance precipitated by acids, we obtain the following proportions:—

No. 1	.	.	.	.	.	8·8 per cent. albuminoids.
„ 2	.	.	.	.	.	5·57 „ „
„ 3	.	.	.	.	.	3·27 „ „

Vasculose, Pectose, Loss, etc.—These have simply been calculated by difference. Thus, in No. 1, 91·908; in No. 2, 85·237; and in No. 3, 67·695 per cent. has been accounted for, leaving—

No. 1	.	.	.	.	.	8·092 per cent.
„ 2	.	.	.	.	.	14·763 „
„ 3	.	.	.	.	.	32·305 „

to represent the fibrous and pectic matters, loss, etc.

Tabulated Results of Analyses.

	Original Sample.	No. 1.	No. 2.	No. 3.
Volatile Oil	1·380	·750	1·350	1·615
Fat, Wax (?) and Resin (P. ether solution)	·835	·700	1·205	1·225
Neutral Resin	·915	·865	·950	2·305
α and β Resins	1·300	·315	·865	1·470
Gingerol	1·210	·660	·600	1·450
Substance precip. by acids	4·600	5·250	5·350	4·650
Mucilage	1·600	2·390	1·450	1·190
Indifferent Substance precipitated by Tannin	1·500	} 4·360	6·800	·700
Organic Acids, etc.	1·750			
Extractive (soluble in S. V. R., not in Ether or Water).	·800	·400	·280	·625
Alkaloid	a trace.	a trace.	a trace.	a trace.
Metarabin	23·880	28·080	8·120	1·860
Starch	18·750	18·120	15·790	13·500
Pararabin	2·490	·086	14·400	6·360
Oxalic Acid (as $\text{Ca C}_2\text{O}_4$)	1·240	·642	·427	1·440
Cellulose	5·710	3·500	3·750	6·250
Albuminoids	6·880	8·800	5·570	3·270
Vasculose, etc.	9·080	8·092	14·763	32·305
Moisture	11·020	13·420	13·530	14·515
Ash	5·060	3·570	4·800	4·270
	100·	100·	100·	100·

	Original Sample.	No. 1.	No. 2.	No. 3.
Ethereal Extract	5·64	3·28	4·97	8·06
Aqueous „	9·45	12·00	12·10	7·50
Alcoholic „	·80	·40	·28	·63
Alkaline „	23·88	28·08	8·12	1·86
Starch	18·75	18·12	15·79	13·50
Acid Extract	4·32	1·00	14·96	10·92
Cellulose, etc.	21·08	20·13	25·45	38·74
Moisture	11·02	13·42	13·53	14·52
Ash	5·06	3·57	4·80	4·27
	100·	100·	100·	100·

Comparison of these results reveals the singular fact that the variety of ginger most esteemed contains only about half the quantity of essential oil found in the other varieties, and less of the active principle than either the African or common Jamaica, and about as much as good Cochin. It would be interesting to have

prepared samples of the essential oils from these various sources, in order to ascertain their physical and chemical properties. But as possibly in all cases the aroma would be affected by distillation, it would be necessary to devise some other method of obtaining them. Undoubtedly the volatile oil in the finest Jamaica gingers possesses a finer bouquet than the others.

The very dark colour of tincture of ginger when made from the African rhizome is evidently due to the large percentage of the neutral, and α and β , resins contained therein, and as these are tasteless and apparently inert, their presence only deteriorates the value of the ginger.

The most striking difference in the constitution of the varieties examined is the relative proportions of metarabin and pararabin which they contain. It is easy to distinguish between a sample of Jamaica and one of Cochin ginger, when in powder, by maceration for forty-eight hours in a 1 per cent. soda or potash solution. If, however, the fibrous portion of the rhizome has been removed by sifting, as is generally the case with the finer qualities of powder, the test does not give such decided indications, from which it may be inferred that the fibrous portion is the seat of this metarabinoid substance.

The same author also read a paper on—

SOLUBLE ESSENCE OF GINGER.

By J. C. THRESH, F.C.S.

Since the publication of my short paper on the above subject, which was read at the Conference last year, I have received a number of letters from chemists, and others interested, some containing suggestions, others queries. These chiefly referred to the essence becoming turbid after being kept some time, and to the evident loss of active principle, in the magnesia precipitate, this being exceedingly pungent.

To remedy these defects the following modification of the process was devised, by which almost all the active principle is removed from the precipitate, and the product does not become turbid by keeping, as is evidenced by the sample upon the table, which was made before last Christmas.

Take of strong tincture (1 to 1) of finest Jamaica ginger one pint, add in small portions at a time finely powdered slacked lime, shaking

vigorously after each addition, until the tincture ceases to lose colour, throw the whole upon a filter, and pass through the residue proof spirit until the product measures two pints. Now add drop by drop dilute sulphuric acid until the rich yellow colour of the tincture suddenly disappears, let stand for twenty-four hours, filter, dilute with water to four pints, shake with a little powdered pumice or silica (by no means lime or magnesia), and filter at 0° C. if possible.

Rationale of the Process.—As may be gathered from a consideration of the constituents of ginger root, the alcoholic tincture will contain besides the extractive soluble in water, which need not further be considered, essential oil, neutral resin, α and β resins, gingerol, and small quantities of the red fat, wax (?), and peculiar extractive insoluble in ether. Upon agitating the tincture with lime, the greater part of the α and β resins is removed, and by addition of the acid the lime which has entered into solution is precipitated. The addition of water precipitates the neutral resin, wax, fat, and peculiar extractive, and unless the ginger from which the original tincture was prepared was poor in oil, the excess of volatile oil also.

As in probably all cases the soluble essence is saturated with essential oil, the final filtration must be effected at a lower temperature than any to which the essence is likely to be exposed.

The product as thus obtained is very pale in colour, but if a darker essence is preferred, it is only necessary to add one or two drops of solution of potash to give an alkaline reaction, when the rich orange tint due to the action of the alkali upon the β resin will be immediately produced.

The PRESIDENT congratulated Mr. Thresh upon his able report, and congratulated the Conference on being the means of inducing him to pursue his inquiries on this truly pharmaceutical subject.

Mr. UMNEY (London) said scientific chemists and pharmacists were greatly indebted to Mr. Thresh for having brought this subject forward. It had been a standing disgrace that a drug they daily handled in a variety of forms, such as African, Cochin, and Jamaica ginger, was not thoroughly understood by them. Mr. Thresh had placed the subject before them very exhaustively, and from his paper they would be able to follow with certainty the pharmaceutical aspect of ginger. The soluble essence of ginger was a most elegant preparation, and useful for the manufacture of aerated water. The difference noticed in specific gravity of portions of the volatile oil

was probably due in the main to the different processes by which the oils had been obtained. Those who had distilled essential oils knew that according to the heat used in their production they differed slightly in specific gravity. No doubt, according to whether this oil were made with petroleum spirit, or by distillation, the specific gravity would vary somewhat.

Mr. GREENISH remarked that he had examined microscopically sections of Jamaica and African ginger root, and found that a very large amount of starchy matter was developed in the Jamaica root as compared with the African ginger; but African ginger, if subjected for a series of years to the same amount of cultivation as Jamaica ginger, might possibly lose some of its pungent character, and develop starchy matter to an equivalent extent.

Mr. W. L. HOWIE (London) adverting to Mr. Thresh's statement that the oil of ginger odour did not recall that of ginger, said he was inclined to think that possibly the smell was masked by that of the petroleum spirit used in its extraction. The difference in the specific gravity of the oils was due to some extent to the method followed; but it might also be due to a change which he believed took place in the oil when it had been kept some time. A small quantity of oil of ginger, which he had had in his possession some years, and which had, he believed, been made by distillation, he found to be but sparingly soluble in rectified spirit—not more perhaps than one in ten, and even with one in fifty there were still left some small whitish globules, which, when separated and exposed to heat, dried into a clear glassy resin, with scarcely any odour or taste. After exposing a little of the oil for some days, in a watch-glass, to a temperature of 100° F., there remained a resinous residue like the other in appearance. He made these remarks in order that Mr. Thresh's attention might be directed to the further examination of the oil, so as to discover whether or not it was a compound, and what was the character and extent of the change which occurred in it when kept for a long period.

Mr. MARTINDALE (London) observed that from a medical point of view, and having before them the prospect of a new Pharmacopœia, it was doubtful whether it would be advisable to introduce soluble essence of ginger into it or not; although as a commercial article it might be very useful. The syrup of ginger was, in the present Pharmacopœia, prepared from the essence, and did not make a very elegant preparation. It might be improved if it were not opaque, but prepared from a soluble essence. The old London syrup was made from an infusion, which contained the metarabin Mr. Thresh

had mentioned and made it a mucilaginous, and not very satisfactory preparation.

Mr. F. B. BENDER (Manchester) remarked that the paper, which was by a pharmaceutical chemist actively engaged in their business, was of great practical value, and might be taken as the type of the sort of papers it was desirable to bring before the Conference.

Mr. THRESH, in replying, said that he thought the essential oil exhibited did not smell of petroleum spirit. He had distilled a sample of the oil directly from an ethereal extract, and found that it had exactly the same odour as that distilled from petroleum extract; it was therefore quite impossible for it to have the odour of petroleum. He had observed (as also had Mr. Umney) that in distilling an ethereal or alcoholic essence of ginger a considerable quantity of oil came over at that low temperature, and he felt confident that this more volatile portion, which was lost, had the finest aroma. Again, he did not think it desirable to put the soluble essence of ginger into the Pharmacopœia for its own sake; but, as suggested by Mr. Martindale, it might be advisable to employ it for making the syrup of ginger, as the syrup thus prepared was really a much more elegant one than that made by the officinal process. The active principle was certainly very soluble in dilute spirit, but as the soluble essence must contain some essential oil also, it was impossible to make it of equal strength with the B. P. strong tincture; nevertheless by removing the inert resins they were enabled to make a stronger solution than would otherwise be possible.

The PRESIDENT asked if Mr. Thresh had made any special examination into the nature of the oil itself, as to its boiling point.

Mr. THRESH said he had not. His time was limited, and the isolation of the active principle took so much time that he had not been able to pursue the subject further.

Professor ATTFIELD hoped Mr. Thresh would continue the investigation, and examine the oil as well as the other principles, applying to the committee for a grant to cover any outlay.

The PRESIDENT was exceedingly glad so many able men had spoken of the value of the paper, and he hoped they would join him in passing a very hearty vote of thanks to Mr. Thresh for his able report.

The motion was carried unanimously.

The Conference then adjourned for luncheon.

After returning from luncheon the first paper read was on—

THE GROWTH AND DEVELOPMENT OF CLAVICEPS PURPUREA (TULASNE).

By W. W. STODDART, F.I.C., F.C.S., F.G.S.,

Lecturer on Forensic Medicine at University College, Bristol.

At the end of the year 1877, a farmer residing in the neighbourhood of Bristol, requested me to investigate the death of some sheep which had taken place every autumn without any assignable cause, so much so that a heavy loss was annually incurred. Many visits were consequently paid to the farm for the purpose of finding out the cause of disease. I noticed that the sheep were fed only on the natural herbage grown on the spot. It consisted of two kinds of clover, the ordinary Dutch (*Trifolium repens*, L.), and the common purple (*T. pratense*, L.). With these were the ray grass (*Lolium perenne*, L.), or as it is commonly but erroneously spelled "rye" grass. A strict inquiry being made as to the symptoms, the farmer informed me that they were always the same, and generally supervened in the month of August, when this very peculiar illness on the farm became prevalent. It took the form of dysentery, inflammation of the bowels, diarrhoea, the evacuations resembling coffee grounds, afterwards succeeded by exhaustion, collapse, and death.

Analyses of water and the soil were made for the purpose of detecting any deleterious metal or other irritant poison. No satisfactory result followed, and the cause of the illness seemed to be mysterious and inexplicable. At length I heard that the ewes sometimes slipped their young, which gave a remote suspicion that the cause of all might be due to ergotism. An inquiry was then made as to the presence of gangrene, when the unexpected but significant remark was made, that although the farm was on a dry, porous, sandy slope, yet the sheep always had the "foot rot," even in the summer, which defied all the remedies that usually proved effectual. With this idea in my mind, and while watching the lambs feeding, I noticed that they avoided the old mature plants, while they greedily devoured the young green ones.

On examining more minutely the former, I noticed several well-formed, purplish, dark coloured ergots were projecting from the palææ, but could not discover a single specimen on the younger fresh plants. Several of these ergots were then taken home for chemical and microscopic examination. I made a considerable number of

sections which exactly coincided with the beautiful and truthful engravings in the paper by Tulasne, in the *Annales Sc. Nat.* for 1853, *Sur l'Ergot des Glumacées*. While here, I must stop to express my admiration both at the accuracy of these microscopic delineations and the description of the metamorphoses of this curious fungus. I thought that this would be a good opportunity of studying the growth of this vegetable, and that the result of my observation during the following year might prove to be of some service in the cause of pharmacy.

During the next few months I had only the old and nearly dead stems of the *Lolium* on which I could work, but on the 12th of April I obtained some specimens of the *Lolium perenne*, in which the commencement of the inflorescence was just to be observed. Soon afterwards I made several sections of caryopsides, on which were many thousands of conidia, which seemed rapidly to multiply and to completely fill some of the grains till they protruded far beyond the glumes. In two or three days the sclerotium stage of the mycelium began to change colour and assumed a purplish brown tinge. The sclerotium seemed now to have arrived at what was formerly termed the "splacelia" condition, and was soft, while the upper portion was wrinkled. The exterior was white from the growth of the hyphæ, which seemed to grow with marvellous rapidity, till at length only a small portion of the pistil remained free. Although the conidia were so numerous, I never noticed any on the andrœcium, even when examined with a one-sixth of an inch object glass, while close to them four or five of the caryopsides were completely filled with the little conidia, which are blunt and ellipsoid bodies about $\frac{5}{1000}$ mm. to $\frac{7}{1000}$ mm. in length, and from $\frac{3}{1000}$ mm. to $\frac{5}{1000}$ mm. in breadth. They are curved and divided into two parts, each part containing a nucleus. On touching them with a drop of diluted sulphuric acid, a cilium or minute flagellum was extruded, and when placed in water had a vibratile motion. On examining suspected flour, bread, or pastry, the microscope would always show these conidia, especially with the addition of a little chromic acid.

In the third week of May several small drops of a syrupy substance made their appearance on the stem near the spikelet. If dissolved in a little distilled water and placed under the microscope, the solution would be seen to contain the conidia, and hence I suppose gave rise to the supposition that the honey-dew was intimately connected with the formation of ergot by aiding the growth of the mycelium. But it most probably only attracts and adheres to insects, who by this means convey the conidia to other spikelets, and

thus spread the infection to other grains. This saccharine mixture instantly reduces the copper solution of Trommer's test, thus showing the presence of sugar. When boiled, a slight milkiness is produced and not removed by nitric acid in excess, pointing out the presence of albumen. At this period the ergot attains its full development and gives no blue with iodine, because by the well-known metastatic power of fungi, all starch is removed and an oil substituted. Of this oil, ergot sometimes contains about a third part of its weight.

At this period of its growth each sclerotium gives off the odour of trimethylamine when treated with potass, and produces a red colour. With spontaneous evaporation, after mixing the honeydew with alcohol and a little ether, minute octahedra of mycose are formed, and may be seen with the lens.

On July 18th I first gathered fully formed and mature ergots, which I now produce. They have a dark exterior with a white interior, and give the ordinary red infusion.

On August 1st one of the lambs was taken ill with the usual inflammatory symptoms. The feet also in a few days had a gangrenous appearance, which did not seem to be alleviated by any of the usual applications of silver nitrate, carbolic or cresylic acids. The affection of the feet strongly reminded me of "clavellization," so destructive among the flocks of Italy, France, and Moravia, and has frequently been supposed to have been a variety of variola.

The fungus has now reached the limit of its vegetative or myceloid growth, which plainly ends at the sclerotium stage as our medicinal agent called ergot, by means of which the embryo and most of the caryopsides have been destroyed.

The hyphæ are now ready to spread in every direction and thus extend the vegetative growth, from which only we derive the peculiar medical properties of the *Claviceps* in their greatest intensity and power on the animal economy, and it is now that the greatest effects are produced which are included under the name of "ergotism."

A *post mortem* examination of the sheep showed the presence of the conidia among the "coffee ground" looking fæces. The fungus having now arrived at this stage awaits for appropriate weather and other suitable conditions for the fructifying metamorphosis.

At the end of August one or two of the ergots that had fallen with the stems of the grass on the damp ground I placed, for more convenient observation, on the moist soil of a flower pot. In a few days I noticed on the dark cuticle of the sclerotium several minute excrescences, from which gradually emanated some stalks about 11

to 18 millimetres in length, each supporting a minute round head about 4 millimetres in diameter; in fact, furnishing good characteristic specimens of *Claviceps purpurea*.

It is not to be wondered at that these fungi should have received the names of sphœria or torrubia, because they so much resemble the growth so often described as being found on the heads of caterpillars or larvæ, and used as a medicine in China and Japan.

A very remarkable change now took place in the oil that was so noticeable as long as the condition of sclerotium continued, but directly the mature *Claviceps* appeared, the oil oxidized, dried up, and was found no longer. The round heads of the fungus now became covered with a large number of brown dots, which eventually became the openings of pear-shaped sacs or asci of the perithecium. If a section was made with a sharp scalpel, each ascus was seen to be filled with a glutinous substance containing seven or eight spores. These last adhered to the ergot, looking like a powdery coating, and causing the production of many thousands of conidia on each ergot, and ready for the evolution of fresh mycelium.

This seems to me the true mode of development of *Claviceps*. It commences and proceeds with the vegetative growth till it reaches the sclerotium stage, and at that period possesses in the greatest vigour the medicinal characteristics of ergot.

I have, I think, conclusively found that ergot has the greatest medicinal power in the month of August, and that the experience of six or seven years shows that the same changes take place in the plant at the same period of every year.

It has been known to medical men that the so-called essences of ergot are so uncertain in their efficacy that many, in order to ensure success, have determined to use the powder itself. Dr. Kluge, of Berlin, observed some years since, that for some reason or other the properties of ergot varied according to whether it was gathered *before or after the harvest*. In the former case it had an energetic action, while in the latter it was frequently powerless.

The sheep were distinctly seen to choose the young green grasses and to particularly avoid the older and ripe ones, probably directed by the odour of trimethylamine, for I found that I could not produce this odour till the sclerotium was fully developed and the starch completely gone.

I therefore think the following conclusions may be safely drawn—

1. That for all medicinal purposes, or pharmaceutical preparations, ergot ought to be gathered in the months of August or September.

2. That ergot always attains its greatest intensity at the end of the vegetative period.

3. That the medicinal powers of ergot diminish or disappear as soon as the fructifying period commences.

I have chemically and microscopically examined the ergots produced from the *Lolium perenne* while the plants have been living. The infusion was first treated by the ether process of Stas. On the evaporation of the ether an oily residuum was obtained containing a minute quantity of a resinous substance. The extract was then dissolved in alcohol, afterwards mixed with water and filtered. Chloriodide of mercury caused a precipitate reminding one of a vegetable alkaloid.

I did not detect any crystals of cholesterine that are said to exist in *Secale cornutum*, but phosphoric acid was clearly shown by using molybdate of ammonia and nitric acid.

In toxicological investigations the microscope is the most to be depended upon. The conidia are very abundant, and may always be detected in bread, pastry, or flour, especially if acetic or chromic acids be used to make their presence more evident. The one-sixth or one-eighth of an inch is a sufficiently high power. I always find that this mode of detection is preferable to the use of potash and distillation alone. The little conidia may be generally observed in the intestinal canal of a poisoned person or animal.

The PRESIDENT, in inviting discussion, remarked that the Conference had been favoured by Mr. Stoddart with an extremely suggestive and interesting paper.

Mr. LUFF said he should like to ask two questions of Mr. Stoddart. Some months ago a toxicological case was entrusted to him for investigation. It was that of a young woman's stomach in which ergot was found. He would ask Mr. Stoddart whether he noticed in the stomachs of the sheep during *post mortem* examinations very rapid decomposition. He was present at the *post mortem* examination of the young woman, and very rapid decomposition set in during the course of twenty-four hours. At the inquest the medical witnesses wished to show that that proved the presence indirectly of ergot. He also wished to ask Mr. Stoddart whether he noticed the presence of the poison in the second or in the fourth stomach of the sheep.

Mr. THRESH said he should like to know definitely whether it was the same fungus that produced ergot in the rye grass as produced it in the rye.

Mr. GREENISH thought this an extremely interesting subject to pharmacists, because ergot was the only fungus in the Pharmacopœia. To investigate the subject properly it really required a knowledge of botany, of the microscope, and of fungology. It was important to observe that the ergot just referred to was not ergot of rye, but an ergot of one of the grasses, and it appeared to have been exceedingly active and very poisonous. There had been lately presented to the Museum of the Pharmaceutical Society some of the ergot of Diss, also a grass ergot from Algeria, which was longer and more slender than the ordinary ergot of rye. It was said to be a much more active ergot. There had not been sufficient opportunity yet to enable this point to be decided, but it would be possible to get any quantity from Algeria. There was one point he could not very well understand. Mr. Stoddart had said that the ergot on the young grass was very poisonous to sheep; and he (Mr. Greenish) assumed that on the young grass it would not be the fully developed ergot. At the same time Mr. Stoddart had stated that the ergot for pharmaceutical purposes would be best obtained fully developed, and the fully developed ergot could not be got till about the month of August. He asked how it was that the ergot was more active before it was fully developed on the young grass, and yet it should not be obtained for pharmaceutical purposes until it was fully developed.

Mr. UMNEY said, with regard to the closing statement of Mr. Stoddart's remarks on the pharmacy of ergot, viz., "that the preparation of ergot must either be an ethereal or an ammoniacal one," he would say that he must take exception. The ether directed in the Pharmacopœia process was used to extract the fixed oil, and for the preparation of the extract the ether was driven off and the oily residue thrown away, the preparation therefore was an aqueous one.

Professor ATTFIELD said that probably many cases of poisoning which had hitherto puzzled analysts were explicable now with the facts which Mr. Stoddart had brought forward. A few weeks ago he had had one of these puzzling cases brought under his own notice; and he mentioned it because he thought a great deal of light had been thrown upon it by what he had heard from Mr. Stoddart, and because it to some extent supported Mr. Stoddart's conclusions. Some heifers which were turned into a particular pasture died. He examined the contents of the stomachs of these animals, but could find no trace whatever of any of the ordinary poisons, or even of unusual poisons. He suggested that the farmer

should instruct a botanist to examine the pasturage for poisonous plants or plants which would be likely to produce irritation enough to cause death; but he examined the contents of the stomach microscopically as well as chemically, and found present crowds of minute bodies which he now thought must be the conidia to which Mr. Stoddart had referred. They were minute things seen very easily with a quarter inch power. They were somewhat sausage shaped, only thicker at one end than the other; and they afforded evidence of structure. He believed they were identical with those alluded to by Mr. Stoddart.

MR. STODDART, in reply, alluded first to the question put by Mr. Luff as to putrefaction taking place in the stomach. He generally found that blood was the first thing to putrefy; and he believed that what he had alluded to as being comparable to coffee grounds was simply coagulated blood. Whenever he got a stomach—and they were very frequently brought to him—and he saw there was much congestion—in other words, much blood—he assumed that probably strychnine had been used. So accustomed had he been to see the effects of strychnine, that he was often able to say whether animals or men had been poisoned by that means, as decomposition would set in sooner than by the use of any other poison. He had usually found that to be the case. In answer to Mr. Greenish he repeated what he had previously stated, that the best time to gather ergot was in its maturity in the sclerotium condition. With regard to Mr. Umney's observation, it only proved what he had said, that doctors differed considerably.

THE PRESIDENT said the Conference was much obliged to Mr. Stoddart for his extremely interesting paper, and gave him a cordial vote of thanks for his labours in this direction.

The next paper read was on—

THE POLARIMETER AND ITS USE IN PHARMACY.

BY CHARLES SYMES, PH.D.

For the development and perfecting of the science and practice of pharmacy, various instruments and forms of apparatus have from time to time been introduced; it is not, however, to a new instrument that I am desirous of directing your attention, but to one which, although it came into existence some sixty years ago, has not in this country and in recent times received the amount of

attention which it appears to me to merit, nor has it been applied to many purposes for which it seems calculated to be of use.

In its variously modified forms it is known as the polariscope, saccharimeter, polaristrobometer, and polarimeter, men of science and manufacturers having progressively introduced such alterations as appeared desirable for the better accomplishment of the object aimed at, viz., polarizing a ray of light and accurately measuring the amount of rotation produced in that ray when it is passed through an optically active liquid or liquid possessing rotatory power. My chief aim in bringing this subject before the members of the Conference is to offer for their consideration some of my experience, and to render familiar, as far as I am capable of so doing, this instrument which has hitherto been dealt with chiefly in works of a purely scientific character, and which has been regarded by the working pharmacist as outside his province and useful only in the prosecution of abstract science. That too little is known of its general application has long been my opinion, but this was brought more forcibly to my mind in June of last year, when (in company with Mr. Greenish) I paid a short visit to M. Petit, of Paris, and found him using the instrument of Laurent practically in his business for determining the purity of certain alkaloids, etc., and was assured by him that the results obtained were as trustworthy as those of the most accurate chemical analysis. To accomplish the object already mentioned, and render the subject thoroughly clear to those who have not previously given any attention to it, I may be allowed to say a few words on polarized light.

A ray of common light, as you will be aware, is assumed to consist of vibrations in the ethereal medium or luminiferous ether occurring in two directions at right angles to each other, and by interference the primary planes are constantly shifting. If, however, these two vibrations are split up by the absorption, reflection, or dispersion of one, or by refraction of both, the remaining portion, or one of the portions separated, constitutes a ray of polarized light, and as the phenomenon of interference ceases it vibrates in one plane only. If now this is made to traverse certain media, the plane no longer remains in this direction, but is deviated either to the right or left, and is caused to rotate or assume a spiral form, and it is as already stated for the measurement of the amount of rotation caused by different fluids when so traversed that the polarimeter has been constructed.

The property possessed by quartz of circularly polarizing a ray of light was known to Sebeck and Arago, but it is to Biot in 1818,

that we owe the discovery of the property possessed by many fluids of rotating a ray of plane polarized light. He states that this occurred to him accidentally whilst examining crystallized laminae, placed in highly refractive media, such as oil of turpentine. He thoroughly investigated the phenomenon, and laid the foundation of a very important study, his early results being obtained by means of an instrument devised by himself, not unlike the polariscope attached to the microscope, except that the polarization was obtained by reflection from a blackened mirror, and that the analyser was placed in the centre of a graduated disc. When the analysing prism was so placed as to obscure the polarized ray, on interposing a tube containing an active fluid the light was again found to pass until the analyser had been rotated through a certain number of degrees; that number being taken as the rotatory power of the fluid; but it was found difficult to determine the exact point of maximum darkness, and somewhat wide and inaccurate results were obtained. M. Soleil, an instrument maker of Paris, next constructed with considerable ingenuity and skill an improved form, by the use of which much greater accuracy could be obtained. In it the light first passes through a doubly refracting prism as polarizer, then through a plate of quartz 3.75 mm. thick (subsequently replaced by a double plate); then through the fluid under examination, another plate of quartz, the compensator consisting of two wedges of quartz, and finally through the analyser. To this there was added what Soleil called a *produce of sensible tints*, consisting of a prism, Galileo telescope, and quartz plate. On one occasion I spent a profitable hour or two in thoroughly examining this instrument, taking it to pieces and tracing the tortuous course of a ray of light through it; the study was interesting as showing what optical skill can accomplish and what complicated means had here been employed to surmount difficulties, which have since been overcome in a more simple manner. The special features in this instrument are first, that the ray of polarized light emerging in a vertical plane from the prism meets the double plate of quartz, one half of which rotates to the right, the other half to the left, the rotation being sufficiently great (90°) to decompose the ray and to produce a rose-violet tint uniformly over the whole field. This is known as the sensitive or transition tint, also the tint of passage. Secondly, the analyser is fixed with its axis corresponding to that of the polarizer, the amount of rotation produced being measured by compensation, effected by a plate of quartz, divided into two wedges and fitted with rack and pinion motion, by which they are moved over

each other so as to increase or diminish the thickness; they are also attached to a vernier and scale. When the compensator is at zero, the whole of the disc is rose-violet, but the introduction of an active fluid causes one half to become red; the compensator is then moved through a sufficient number of degrees to restore uniformity, and the amount of rotation is thus ascertained. Actual degrees are not marked in the scale, but the rotation produced by a plate of quartz 1 mm. thick, equal to that given by 200 mm. of solution of sucrose (16.19 grams in 100 c.c. of water), being marked on the scale and divided into 100 equal parts.

The instrument was specially constructed with a view to its use for sugar solutions, and is best known as Soleil's saccharimeter, of which there are several modifications, such as the Soleil-Ventzke, Soleil-Scheibler, etc.

Accurate as were the results obtained by this means, there were some difficulties, such as the interference of coloured solutions with the sensitive tint, the shortness of the scale, etc., which have caused it to be superseded by more simple forms in which, as in Biot's instrument, the analyser is made to rotate, and these forms have been adopted by the two opticians Duboscq and Laurent, who may be regarded as the successors of Soleil.

In 1860 Professor Jellett, of Dublin, described to the British Association at Oxford, a new analysing prism, which he had invented, by which greater accuracy could be obtained than by any previous arrangement. The report is as follows: "Professor Jellett described to the section a new analysing prism, by which the plane of polarization of polarized light may be determined with great precision. This instrument consists of a large prism of calc-spar, which is reduced to the form of a right prism by grinding off its ends, and sliced lengthwise by a plane, nearly, but not quite, perpendicular to its principal plane. The parts into which the prism is thus divided are joined in reverse positions, and a diaphragm with a circular opening is placed at each end. The light which passes through both diaphragms produces a circular field, divided by a diametrical slit into two parts, in which the planes of polarization are slightly inclined to each other. If then light, which has been previously polarized, be transmitted, it will be extinguished in the two parts of the field of view in positions which lie close together, and the light will become uniform in a position midway between these. This position determines the plane in which the incident light was polarized with a precision much greater than has been otherwise attained. Professor Jellett stated that the different

observations did not differ from one another by an angle greater than a minute, and that the instrument was equally applicable to the case of homogeneous light."

The first practical application of this invention was in the construction of a polarimeter for the Professor by Bryson in that year, and the manufacture is continued by the same optician at the present time; it is the most simple form with which I am acquainted, efficient and inexpensive; it is the instrument now before you, the one with which my observations have been made, and which I have compared with those of Wild, Laurent, and Duboscq, with very satisfactory results. The instrument of the last named maker still retains the double quartz plate of Soleil, but dispenses with the compensator, having been fitted with a Jellett's prism as analyser on a suggestion made by him in 1869.

That of Laurent has as its special feature the polarized ray passed through a diaphragm with circular opening, one half of which is covered by a plate of quartz, the division of the field by this means giving great precision to the readings; the analyser is an ordinary Nicol's prism. By this means the optical work is simplified as compared with the old form, and the perfection of working is enhanced. Wild's polaristrobometer, manufactured by Hermann and Pfister, of Berne, is a special form of the instrument. It is somewhat elaborate in construction; the readings are taken at the disappearance from the centre of the field of certain lines or bands which cross it, and which are produced by two plates of calx spar crossed at right angles to their principal faces. Those who work with this instrument speak of it as giving very satisfactory results. In 1872 Professor Jellett, in a paper read before the Royal Irish Academy, described a "new optical saccharometer," an ingenious arrangement by which the polarized ray is made to traverse a fluid, the rotatory power of which is previously determined, and which is opposite in character to that of the fluid to be examined. In general terms, it might be described as an instrument by means of which the relative rotatory power of any transparent fluid to that of a standard fluid may be accurately determined. Although delicate in its results, it is somewhat troublesome in working, and does not appear to have come into general use.

Originally, ordinary daylight, or that from an Argand lamp, was used; but on discarding the more complicated instrument of Soleil, with its compensator, whereby the decomposition of the light due to the unequal refrangibility of the different rays was overcome, monochromatic light was adopted. Different operators, however, used

different coloured rays with, as matter of course, different results; hence it became necessary when stating the rotatory power of a body to indicate by what ray the reading was taken, and this still obtains to a large extent; thus, in the *Agenda du Chimiste* last year there are four tables giving the rotatory power of 76 bodies—12 by the “*teinte du passage*,” 7 by the red ray, 10 by the yellow, and 20 without any indication as to the ray, and the remainder indicated by letters corresponding to certain Fraunhofer lines, as used by the authorities from whom the results are quoted. It is true we have a factor, $\cdot 767$ by which to multiply the values obtained by the yellow ray to convert them into those which could be obtained by the red, but it has been shown that this is not constant for all bodies. Further, one object of a table is to show at a glance without calculation the relative rotatory power of different bodies; now this clearly cannot be the case with such tables as those referred to. This chaotic state of things is to some extent in process of rectification, and modern instruments are all constructed with a special view to their use with the yellow flame, corresponding to the line D of the spectrum, or in other words, with a Bunsen flame containing a salt of sodium. This gives a grey field quite as sensitive as the transition tint, and where observations are continued for any length of time it is far less fatiguing to the eye of the observer.

Certain natural crystals possess high rotatory power. Thus a plate of quartz 3.75 mm. in thickness gives a rotation of 90° , whilst a column of English oil of turpentine, 100 mm. in length, gives only $14^\circ 30'$. Some few salts, such as bromate of sodium, chlorate of sodium, acetate of sodium and uranium and hyposulphite of lead possess double rotatory power; but most inorganic salts, and some liquids, such as water, alcohol, ether, and chloroform, are inactive. The activity in crystals and liquids depends on different causes, the former belongs to the domain of physics, the latter to that of chemistry, and it is this, viz., the molecular rotatory power, which we are more especially considering. The rotation produced by any given liquid (all else being equal) depends on the length of the column; it will be evident therefore that to have uniformly correct results the greatest accuracy must be observed in this respect, and that either the same length of tube must always be used, or the readings must be brought to the same standard by calculation. The usual working length is 200 mm., but most operators supply themselves with tubes of 100, 50, and even 25 mm., as some of the fluids to be operated on possess so much colour that light will not pass through a larger column satisfactorily. It is desirable to use the larger tube

whenever available, inasmuch as the error will be thereby diminished; but whatever be the dimensions of the tube used, the results should be stated in terms corresponding to a column of fluid 100 mm. in length, this now being generally accepted, and $[a]$ is used to indicate the molecularly rotatory power of such a column. Hesse, however (*Chem. Centr.*, 1875, 369; *Journ. Chem. Soc.*, 1876, 667), in referring to the results obtained by De Montgolfier, Weiss and Biot, points out the difference obtained by the ray D, the red and transition tints, and concludes that this symbol is equivocal, and suggests that it is better to use a_D for the rotatory power obtained by the yellow ray, as has indeed been the practice for some time in Germany.

When the transition tint was almost exclusively adopted, the sign $[a]$ was used to indicate the rotatory power read by it, otherwise it would have been more simple to have adopted this sign where the sodium ray was used, and to have used the qualifying letter only when other rays were employed, which is now rarely done.

Temperature influences the rotatory power to some extent, 15.5° C. (60° F.) being that at which readings are usually taken, and it has been found that the rotation decreases as the temperature increases, and *vice versa*; but Landolt has shown that the diminution is not always uniform at all temperatures for the same body, or equal for all bodies. He gives as examples—

Oil of Turpentine $[a]_D$ 36.61° : diminished rotatory power for an increase of 1° C. = $.004437$.

Oil of Orange $[a]_D$ 115.31° : diminished rotatory power for an increase of 1° C. = $.12371$.

This diminution being represented graphically, not by a straight but by a slightly curved line. This, I think, would depend entirely on the expansion and rate of expansion of the liquid, inasmuch as an increase of temperature would necessarily increase the volume and reduce the number of molecules in a column of a given length; the slight expansion of the tube would tend in some degree to compensate for this, and in most fluids the difference for two or three degrees of temperature is so slight that it might be disregarded as being less than the probable error of observation.

Magnetism also influences rotation; indeed some bodies which are void of this property under ordinary circumstances, will under its influence exercise it in a marked degree. The discovery of this phenomenon we owe to Faraday (*Phil. Trans.*, 1846, p. 1), and it has been further investigated by De La Rive (*Archives des Sciences, etc.*, vol. xxxii., p. 193; *Annales de Chimie*, 4th series, vol. xv., p. 57;

Phil. Mag., 4th series, vol. xl., p. 393); this is, however, a study in itself, and those who wish to prosecute it will find abundant matter of interest in the papers quoted; suffice it to say that under the influence of magnetism the same law holds goods as regards decreased rotation for increased temperature.

The advantage of having certain commonly occurring liquids, such as those mentioned, void of activity, is obvious, as it enables us to make concentrated solutions of most solid substances, such as sugar, camphor, the alkaloids, etc., and to select a menstruum in which the body is most soluble, since *concentrated* solutions are most desirable, inasmuch as the calculation is made for the solid substance and any error in observation will be increased in proportion to the dilution. Not only so, but it has been shown by Landolt (*Deut. Chem. Ges. Ber.* [9], 901-904) that to obtain accurate results, *saturated* solutions are absolutely necessary, for as in the case of temperature so in dilution, the effect cannot be represented graphically by a straight line. In concentrated solutions the divergence is only a few tenths of a degree, and the rotatory power of the body remains the same whatever be the (inactive) solvent employed; but observations taken with dilute solutions are utterly worthless. He further finds (*Liebig's Annalen*, clxxxix., 241-337) that some substances have an increased proportional rotation by dilution, whilst others are diminished; turpentine and ethyl tartrate always show increase, nicotine and camphor both show diminution, and these results are constant with all solvents.

Organic liquids and solutions are sometimes so much coloured that light will not pass through even 25 mm. sufficiently for our purpose. In such cases filtration through charcoal is usually resorted to; this under ordinary circumstances removes enough of the colour to admit of the observation being made, or indeed sometimes entirely decolorizes. But this procedure introduces a possible source of error, inasmuch as it has been shown by Dr. Stammer (*American Chemist, from the Sugar Cane, Pharm. Journ.* [3], vol. i., p. 926), that in the case of saccharine solutions the char absorbs sugar from the first portion of the liquid, which passes through and so reduces the strength and rotatory power. This would doubtless occur equally with solutions containing alkaloidal bodies and possibly some others; but as the char becomes saturated before it loses its decolorizing property, if a sufficient quantity be passed through, and the latter portion be taken for examination, the chance of error on this point is obviated.

The great commercial industry in which the polarimeter has been

most useful is the sugar trade, and as the expenditure of large sums of money is not unfrequently dependent on the results so obtained, it is not surprising that the greatest perfection in construction and working has been sought for its special requirements.* There is, however, good reason to believe that of the other spheres of usefulness as yet unknown (in addition to those which are known), some are closely allied, whilst others belong to the domain of pharmacy. By its means (as already stated) the purity of the alkaloids can be readily determined; castor oil, croton oil, and doubtless some others of this class possess their specific rotatory powers, whilst the majority of essential oils do so in a high degree. Landolt, who has worked largely with bodies of a definite and constant chemical constitution, does not appear to have as much faith in its application to essential oils on account of some amount of variation dependent on soil, climate, etc., and in his recently published memoir he devotes but little space and consideration to them.

Oil of turpentine and other volatile oils were, however, amongst the first liquids examined in this way, and connected with which an interesting incident occurred. Biot, in announcing his discovery in 1818, called especial attention to the fact that whilst in quartz or rock crystal there existed two opposite directions of rotation, in oil of turpentine the rotation was in one direction only, viz, from the right to the left of the observer, and this was the same in direction, although slightly different in degree, for all samples examined. This statement remained unchallenged until 1843, when Dr. Leeson read a paper before the Chemical Society of London, entitled "Observations on the Circular Polarization of Light by Transmission through Fluids." In this paper he stated that every sample of oil of turpentine which he had examined possessed a *right handed* rotation coinciding in direction with that produced by essence of lemon. These conclusions were so thoroughly opposed to those of Biot, that Dr. Pereira undertook to further investigate the subject, and by procuring reliable samples of French oil of turpentine from M. Guibourt, of Paris, he was enabled to demonstrate the fact that both observers were correct; that the French oil rotated to the left, the English or American to the right, and that a mixture of the two in proper proportions possessed no rotatory power whatever. (*Pharm. Journ.* [1], vol. v., p. 67.)

* Those who are interested in the various kinds of sugar will do well to peruse an excellent paper by Dr. O. Hesse, "The Behaviour of Solutions of some Substances to Polarized Light," (*Pharm. Journ.*, 3rd series, vol. vii., pp. 191, 410 and 473).

My first experience in the use of the polarimeter was in a direction not altogether pharmaceutical, but one which nevertheless merits attention from pharmacists, viz., in the examination of urine; it is a legitimate branch of our calling, and one which medical men are usually willing to delegate to us; it possesses considerable interest, and the remuneration is not influenced by unfair competition on the part of uneducated outside traders. It was diabetic urine, containing in round numbers only 2 grains sugar per ounce; subsequently other experiments were made with samples containing larger quantities, but my experience led me to the conclusion that this method of determination is more troublesome and not more accurate than the copper test of Fehling or the recent one of Pavy, although its use has been recommended by Méhu and others. Passing on to essential oils, the work became interesting, although occasionally disappointing; for example, essential oil of bitter almonds distilled in this country, that from abroad (which is often obtained from a mixture of peach kernels and almonds), and the artificial, or oil of mirbane, are all optically inactive; hence the polarimeter does not furnish us with a means of distinguishing between them. Other results are very satisfactory. Thus, finest imported otto of rose is levogyrate, giving a rotation of -3.52° . A common quality was found to be dextrogyrate, giving $+1.50^{\circ}$. Now the lower qualities of otto are known to contain varying proportions of oil of geranium; but on examining the only sample of this oil which was then at my disposal, and which had been received from the south of France, it was found to give -6.73° . This, then, could not have been the article used in adulterating the sample in question; but subsequently, on examining the Turkey oil of geranium, a solution of the problem was furnished, since it gave a rotation of $+1.72^{\circ}$, and indicated that it constituted the bulk of the so-called common otto of rose. It was found too that otto of rose distilled in this country possessed an opposite rotatory power to that of the finest imported, as indicated in the table appended to this paper. On examining many samples of oil of lavender, it was found that some of the commoner were adulterated with turpentine, and there was no difficulty in determining whether this had been done in France or England, on account of the different rotatory powers of the turpentines in the two countries. Whilst prosecuting this study my attention was directed to an excellent paper by Dr. J. H. Gladstone on essential oils (*Journ. Chem. Soc.*, new series, vol. ii., p. 1), in which he gives the specific gravity, rotatory power, and refractive indices of a number of essential oils; also to a less important paper by Dr. Julius Maier, of

New York, "Detection of the Adulteration of Essential Oils with Oil of Turpentine." (*Chemical News*, vol. xi., p. 301, from the *Amer. Journ. Science*, xxxix., p. 273). Since the publication of these, some oils have come into use which were then less known than at the present time, and some others are now supplied from different localities; it was therefore thought desirable to go over the ground anew and to compile a table giving the rotatory power and specific gravity of a somewhat larger number. Such a table is appended to this paper, the samples of oil operated on being the most reliable I could obtain, except where a second quality is mentioned for comparison, and all that were sufficiently colourless to be viewed through a column of 200 mm. were so examined. Some oils, such as those of hops, cassia, chamomiles, myrtle, etc., could only be read through 100 mm.; whilst some, such as patchouli and cajuput, admitted only sufficient light through 50 mm. All have been calculated to 100 mm. and at a temperature of 15.5° C. Many results were obtained which being unimportant are not here recorded, but all tended to experience, and as deductions from which might be mentioned that turbidity even though very slight, materially interferes with the accuracy and sharpness of the readings; it is therefore necessary to filter any oils or solutions which are not perfectly bright. Age does not influence to any extent the optical activity of essential oils. Oil of cloves, new and colourless, and samples of a light sherry and dark sherry colour all registered very nearly the same, and samples of English oil of lavender less than a year, four years and five years old, differed from each other less than one degree.

The *modus operandi* is exceedingly simple. A correct zero must be first obtained thus—one of the tubes being filled with distilled water, the glass disc is slid on so as to exclude air bubbles, and screwed firmly down. It is then placed in position and the instrument brought opposite to a sodium flame; the operation must be conducted in a dark room, or a black covering cloth be used. The analyser is then set so that the arrowhead on the vernier points to 0 on the scale when the whole of the disc is at a maximum of obscurity, *i.e.*, both halves equally obscure; it is necessary to take several readings of this and note down the results, taking the mean of the observations, and if, as sometimes happens, there is any difficulty in getting an exact zero, it is convenient to make a note of the error and add or subtract this from the subsequent readings.

If now the tube be replaced by one containing an optically active liquid, it will be found that the field is entirely illuminated, or that one half is so, whilst the other is obscure. The analyser is then

rotated until equal obscurity is regained, and the number of degrees, minutes, or decimal parts of a degree through which it has been moved, as well as the direction, is noted. For each of the following results ten readings were taken; two of these (the highest and the lowest) were struck out, and the sum of the others divided by 8 gave the mean reading, or where the 200 mm. tube was used, division by 16 gave at once the correct mean for 100 mm. It is, of course, necessary from time to time to check the accuracy of the zero, just as a careful dispenser does the correctness of his scales.

With solid substances, a saturated solution being made in water or other suitable inactive liquid, the specific rotatory power $[\alpha]$ is found by dividing the amount of observed rotation a , by the length of the column in decimetres l , by the weight of the active body in each unit of liquid w , and by the density of the solution d thus,—

$$[\alpha] = \frac{a}{l \times w \times d} =$$

For the loan of authentic specimens of some of the following oils, I have to thank Mr. E. M. Holmes, Curator of the Pharmaceutical Society's Museum. In the following Table the rotatory power is given in degrees and decimal parts of a degree.

Specific Gravity and Rotatory Power of Essential Oils.

OIL OF—	[a]=130 mm. 15.56° C.	Sp. Gr.	Rot. p.
Anise	Pimpinella Anisum . .	0.936	+ 1.00
Do.	Illicium anisatum . .	0.980	- 0.82
Ajowan	Ptychotis Ajowan . .	0.919	0
Angelica	Archangelica officinalis .	0.897	+ 1.78
Almond, English . .	Amygdalus communis . .	1.049	0
Do. Foreign	Do.	1.063	0
Do. Artificial	Mirbane	1.152	0
Amber	Succinum	0.859	+ 1.85
Bay	Laurus nobilis	0.904	- 18.88
Bergamot	Citrus Limetta	0.872	+ 31.25
Birch	Betula alba	0.872	+ 2.18
Canada Balsam	Abies Balsamea	0.914	- 30.07
Clove Bark	Dicypellium caryophylla- tum	1.052	- 2.25
Cardamoms	Elettaria Cardamomum . .	0.976	+ 14.59
Cedrat	Citrus medica	0.969	- 3.00
Cedar, Commercial . . .	—	0.968	- 16.00
Do. Red	Juniperus Virginiana . .	0.960	- 28.75
Carraway	Carum Carui	0.940	- 20.68
Cassia, Pure	Cinnamomum aromaticum .	1.053	- 1.00
Do. Commercial	—	1.021	+ 2.02

OIL OF—	[n] = 100 mm. 15.56° C.	Sp. Gr.	Rot. p.
Cascarilla . . .	Croton Eluteria . . .	0.888	+ 8.65
Chio Turpentine . . .	Pistacia Terebinthus . . .	0.889	+22.55
Cinnamon . . .	Cinnamomum Zeylanicum . . .	1.025	0
Do. Leaf . . .	Do.	1.060	0
Citron . . .	Citrus medica . . .	0.901	+38.31
Cherry Laurel . . .	Prunus Lauro-Cerasus . . .	1.046	0
Citronelle . . .	Andropogon Nardus . . .	0.881	— 0.81
Cloves, English . . .	Caryophyllus aromaticus . . .	1.064	+ 0.50
Do. Foreign . . .	Do.	1.064	+ 0.32
Chamomile, English . . .	Anthemis nobilis . . .	0.906	— 0.95
Do. Foreign . . .	Do.	0.910	+ 6.16
Coriander . . .	Coriandrum sativum . . .	0.876	+10.65
Cummin . . .	Cuminum Cyminum . . .	0.933	+ 4.29
Cajuput . . .	Melaleuca minor . . .	0.924	— 1.52
Cubebs . . .	Piper Cubeba . . .	0.924	—26.07
Copaiba, New . . .	Copaifera multijuga etc. . .	0.920	—13.50
Do. Old . . .	Do.	0.920	—12.52
Camphor . . .	Dryobalanops aromatica . . .	0.856	+ 7.87
Dill . . .	Anethum graveolens . . .	0.860	— 6.24
Elemi . . .	Canarium commune . . .	0.867	— 3.65
Eucalyptus . . .	Eucalyptus Globulus . . .	0.881	—36.30
Do.	E. Amygdala, odorata . . .	0.912	—42.33
Erigeron . . .	Erigeron Canadense . . .	0.885	+72.41
Fennel . . .	Fœniculum dulce . . .	0.998	+25.71
Geranium, French . . .	Pelargonium species . . .	0.906	— 6.72
Do. Tky (Ginger Grass) . . .	Andropogon Schœnanthus . . .	0.880	+ 1.72
Do. Indian . . .	Andropogon . . .	0.896	0
Do. Spanish . . .	—	0.911	— 4.45
Ginger, Jamaica . . .	(English distilled) . . .	0.853	—27.15
Do.	Do.	0.870	—52.25
Do.	(Distilled abroad) . . .	0.907	— 65.00
Rusa Grass (Dr. Dymock) . . .	Andropogon species . . .	0.951	+39.65
Hyssop . . .	Hyssopus officinalis . . .	1.005	—23.63
Hops . . .	Humulus Lupulus . . .	0.890	+ 1.42
Horsemint, American . . .	Monarda punctata . . .	0.934	— 0.76
Jaborandi . . .	Pilocarpus pennatifolius . . .	0.879	— 4.10
Juniper, English . . .	Juniperus communis . . .	0.882	— 5.00
Do. Foreign . . .	Do.	0.855	—18.71
Laurel Oil (from British Guiana) . . .	Oreodaphne opifera . . .	0.917	+27.56
Lavender, English, New . . .	Lavandula vera . . .	0.887	— 8.29
Do. Do. Old . . .	Do.	0.903	— 8.48
Do. Foreign petal . . .	—	0.876	— 5.93
Do. Do. spike . . .	Lavandula Spica . . .	0.880	+13.75
Lemons, best Commercial . . .	Citrus Limonum . . .	0.856	+53.05
Do. extracted by Spirit . . .	Do.	0.852	+57.23
Do. Distilled . . .	Do.	0.848	+22.10
Do. obtained by Sponge Process (Hanbury) . . .	Do.	0.957	+24.26

Oil of—	[a]=100 mm. 15.56° C.	Sp. Gr.	Rot. p.
Limes	Citrus Limetta	0.887	-43.80
Lign Aloe	Elaphrium species	0.925	-2.45
Mustard	Sinapis nigra	1.000	0
Do. Artificial	(Sulphocyanide of allyl)	1.010	0
Myrrh	Balsmodendron Myrrha	0.989	-59.06
Myrtle	Myrtus communis	0.898	+18.79
Myrcia	Myrcia acris	0.939	+6.59
Neroli (Bigarade)	Citrus Bigaradia	0.873	+10.62
Nutmeg	Myristica officinalis	0.988	+24.22
Olibanum	Boswellia Frereana	0.872	-4.61
Origanum, true (Hanbury)	Origanum vulgare	0.891	-30.27
Do. Commercial, white	Thymus vulgaris	0.877	-18.20
Do. Commercial, yellow	Do. . . .	0.877	-23.74
Do. Commercial, red	Do. . . .	0.876	-15.15
Orange, Peel (Essence de Portugal)	Citrus Aurantium	0.848	-16.40
Orange Peel	Citrus Bigaradia	0.856	-2.30
Do. (Distilled in Liverpool). . . .	Do. . . .	0.850	-3.10
Patchouli, French	Pogostemon Patchouli	0.988	-57.10
Do. Penang	—	0.970	-48.26
Parsley	Petroselinum sativum	1.000	-8.90
Do. Seed	Do. . . .	0.945	-14.75
Pennyroyal, English	Mentha Pulegium	0.945	+7.10
Do. Foreign	—	1.019	-8.30
Do. American	Hedeoma pulegioides	0.938	+29.82
Pimento	Eugenia Pimenta	1.036	+2.35
Peppermint, English	Mentha piperita	0.912	-21.23
Do. Foreign	Do. . . .	0.924	-7.49
Do. Japanese	Mentha species. . . .	0.880	-21.81
Petit Grain	Citrus Bigaradia, leaves and shoots	0.900	-4.14
Rhodium. . . .	Convolvulus species	0.931	+10.28
Rose Otto (distilled in England)	—	0.854	+2.50
Rose Otto, Finest im- ported	—	0.877	-3.15
Do. Common	—	0.867	+1.50
Rosemary, English	Rosmarinus officinalis	0.881	-16.47
Do. Foreign	—	0.952	+4.47
Rue	Ruta graveolens	0.886	-3.61
Sassafras (English dis- tilled)	Sassafras officinale	1.072	+2.64
Do. Commercial	Do. . . .	1.084	+2.64
Sandal Wood (English distilled)	Santalum Album	0.958	+2.26

OIL or—	[a]=100 mm. 15·56° C.	Sp. Gr.	Rot.
Sandal Wood, Foreign . . .	—	0·986	+ 8·29
Spearmint, English. . .	<i>Mentha viridis</i> . . .	0·950	—30·28
Solidago Odora, sweet scented Golden Rod . . .	—	0·912	+10·53
Savin, English . . .	<i>Juniperus Sabina</i> . . .	0·927	—32·78
Do. Foreign . . .	—	0·884	+ 2·25
Sweet-flag . . .	<i>Calamus aromaticus</i> . . .	0·926	+14·31
Do. Commercial . . .	—	0·957	+19·60
Sage . . .	<i>Salvia officinalis</i> . . .	0·925	+12·23
Silver-fir. . .	<i>Abies pectinata</i> . . .	0·864	—14·18
Scotch-fir . . .	<i>Pinus sylvestris</i> . . .	0·885	— 9·78
Tansey . . .	<i>Tanacetum vulgare</i> . . .	0·923	+29·48
Thyme . . .	<i>Thymus vulgare</i> . . .	0·891	—10·60
Turpentine, American . . .	—	0·870	+14·30
Do. French. . .	—	0·938	—25·35
Verbena . . .	<i>Andropogon citratus</i> . . .	0·890	— 2·61
Valerian . . .	<i>Valeriana officinalis</i> . . .	0·971	—31·50
Wintergreen . . .	<i>Gaultheria procumbens</i> . . .	1·162	+ 0·81
Wormwood . . .	<i>Artemisia Absinthium</i> . . .	0·971	+17·43
Wormseed . . .	<i>Chenopodium anthelmin- ticum</i> . . .	0·941	— 8·53
Ylangylang . . .	<i>Unonæ odoratissima</i> . . .	0·056	—20·10

Mr. STODDART referred to the extensive use of the polarimeter in the examination of sugar, but said that the value was affected by the difficulty of determining the zero, as in Soleil's polarimeter, different people arriving at different conclusions respecting shades of colour.

Mr. UMEY, adverting to the results Dr. Symes had obtained from the various oils, said he should expect to get a different result from the grass oil of India (*Andropogon*) than from the geranium oil obtained in the south of France.

Professor ATTFIELD observed that the substances Dr. Symes had examined were nearly all mixtures of distinct things. The polariscope was extremely useful in examining a solution of a single substance, such as sugar, but it was not so useful in other cases, unless the nature of the constituents of the mixture was known. Nevertheless, such observations as Dr. Symes's must be useful if they were multiplied, especially as a substance such as an essential oil, when properly obtained and pure, might give a fair average amount of rotation to a polarized ray of light. But he would suggest that many observations would be necessary on the same essential oil before they could well trust to the figures given to them. He hoped Dr. Symes would continue the subject. Perhaps, also, Dr.

Symes, with his intimate knowledge of the modes of construction of polariscopes, would eventually be able to put pharmacists in the way of obtaining a cheap variety of the instrument.

The PRESIDENT said Dr. Symes had spoken of the use of the polarimeter in detecting sugar in urine, and it was a nice point for the physician to discover when the last trace of sugar disappeared from a patient's urine. Before the sugar was lost altogether, it became a very difficult matter to estimate the exact percentage by the ordinary process, and he found when sugar existed in less than 1 per cent. in urine, it was difficult to determine the exact percentage by the ordinary process. If this instrument, therefore, would detect more minutely the exact proportion when it arrived at such a degree of dilution, it would be very useful. Although they might arrive at the exact figure as to the rotatory power of different essential oils, would not the figures have to be varied according to the age of each particular sample?

Dr. SYMES, replying, said that most persons had no difficulty in getting the coloured zero with the Soleil instrument, but the maker finding that it did not suit the eyes of all observers, introduced what he called a *producer of sensible tints*, whereby the flax flower tint could be changed for some other; it consisted of a Galileo telescope and quartz plate. He could scarcely understand any difference existing between the estimation of sugar by chemical means and by the polarimeter. Reading sugar solutions was almost a profession in itself; and the French, who are sellers of sugar, usually read higher than the English, who are buyers. He regarded both Fehling's and Pavy's tests for diabetic urine as equally accurate with the results obtainable by the polarimeter; they were less troublesome, and the work could be with more confidence delegated to another person. He hoped to go on with the study, and that others would take it up, so that ultimately the subject might assume a more definite and important position pharmaceutically. He then spoke of the desirability of obtaining cheaper instruments, and agreed with Professor Attfield that they ought to get them at half their present price.

A vote of thanks was then passed to Dr. Symes for his paper.

The next paper read was on—

THE APPLICATION OF CHLOROFORM IN THE TESTING OF DRUGS.

By L. SIEROLD, F.I.C., F.C.S.

In the *Year-Book of Pharmacy* for 1877 there occurs an abstract of an article by Dr. C. Himly on the "Detection of Mineral Adulterants in Flour by means of Chloroform." Having frequently tried this test, and finding it extremely useful both as a qualitative and as a quantitative process, it appeared to me desirable to ascertain to what extent it might be advantageously employed in the testing of powdered vegetable drugs. As many of the latter are lighter than chloroform, and the usual mineral adulterants sink in that liquid, it was but reasonable to infer that this mode of separation might prove of value to the pharmacist.

I will not trouble the meeting with the details of my experiments, but confine myself to a brief summary of the results. In each experiment a small quantity of the dry powder was well shaken with about half a test-tubeful of chloroform, and the mixture allowed to stand at rest for twelve hours. The following drugs were found to rise so completely to the surface of the chloroform, that the observation and estimation of any mineral adulterant became a very simple and easy task:—Acacia, tragacanth, starches, myrrh, Barbadoes aloes, jalap, saffron, cinchonas, nux vomica, mustard, white pepper, capsicum, and guarana. Known quantities of selenite and of chalk were added to these drugs, and subsequently determined by running the lower stratum of the chloroform with the sediment into a small dish, carefully pouring off the chloroform, drying the sediment at a gentle heat, and weighing it. The result in each case was very satisfactory. No such accuracy could be attained by incineration, as in the presence of chalk there was always a loss of carbonic acid, and in that of selenite a loss of water and of oxygen, the sulphate being partly reduced to sulphide. An estimation of these adulterants by the usual analytical processes would, of course, give exact results, but prove much more tedious.

Both for qualitative and for quantitative purposes the chloroform test therefore answers extremely well with the drugs named. In the case of the following substances no complete rise to the surface of the chloroform took place, but a portion was found to float, and another portion to sink, though the absence of mineral adulterants

was proved by analysis:—Gamboge, scammony, opium, soccotrine aloes, liquorice root, ginger, colocynth, couso, ipecacuanha, cinnamon, and cardamoms. Of the last two, by far the greater portion was found to sink in chloroform. But even in these cases the test is not altogether without value, for a careful inspection of the sediment will show whether or not it is a mixture of various substances, differing in appearance, weight, etc. The mineral adulterant will generally, in such a case, form the lowest stratum of the sediment. A comparison with a genuine sample helps to arrive at a correct conclusion. Moreover, the chemical examination of the sediment gives results which cannot always be obtained by testing the ash. Take the case of cinnamon, for instance, which contains organic calcium salts. These upon incineration leave calcium carbonate, and a qualitative analysis of the ash would therefore fail to show whether this calcium carbonate was solely the result of ignition, or whether a part of it pre-existed in the cinnamon powder as an adulterant; while the addition of hydrochloric acid to the lowest stratum of the chloroform sediment would settle this point at once.

It is, however, in the case of the drug first named that I wish specially to recommend this mode of testing to pharmacists.

The next paper, by the same author, was a—

NOTE ON THE BEHAVIOUR OF IODINE TO CHLOROFORM, AND A NEW TEST FOR THE DETECTION OF ALCOHOL IN CHLOROFORM.

BY L. SIEBOLD, F.I.C., F.C.S.

Every chemist knows the beautiful purple colour of a solution of iodine in chloroform. It does not seem to be so generally known, however, that this colour varies with the degree of purity of the chloroform employed, and that this variation of colour is due to the presence or absence of alcohol.

A solution of iodine in pure chloroform is deep purple-violet, or if very weak it is purplish pink; while a solution of the same substance in alcohol is brown, red, or yellow, according to its strength. In solutions of iodine in mixtures of chloroform and alcohol, the colour of the alcohol solution so predominates over that of the chloroform solution, that the presence of even a small

percentage of alcohol may be readily recognised in a sample of chloroform by comparing the colour of its iodine solution with that of a solution of iodine in perfectly pure chloroform. This mode of testing, however, would necessitate the use of exactly equal proportions of iodine, and of iodine of the same quality and purity, as otherwise the difference in the depth of coloration would materially interfere with the result. I therefore propose the following *modus operandi*, which on the strength of numerous trials I can recommend as a very simple, expeditious, and reliable one:—

Introduce a small quantity of iodine into about 10 to 15 c.c. of the chloroform to be tested, shake until the solution has acquired a deep purple or purplish red colour, not so deep, however, as to render it opaque, and decant the solution from the undissolved iodine. Divide the solution into two equal parts, which place in two separate test tubes of equal diameter, shake one with about four times its volume of water, and keep the other as it is, for comparison. The water will absorb the alcohol, and what settles down is a solution of iodine in pure chloroform, the colour of which will be exactly the same as that of the other portion if the chloroform was pure, but will distinctly differ from it if the sample contained alcohol. With 2 per cent. of alcohol or more, the difference of colour is very striking indeed; with 1 per cent. it is very distinct, and in the presence of only half a per cent. it is still clearly discernible. As little as half a per cent. of alcohol can therefore be readily detected in this manner. By resorting to distillation, a quarter of a per cent. and even less of this impurity may be detected by using the first portion of the distillate for the test. It is a curious fact that, though chloroform boils at 62° C., and alcohol not under 78° C., the first portion of the distillate is richer in alcohol than the original sample, and that the distillation, if continued, finally leaves pure chloroform quite free from alcohol in the retort. The cause of this must be sought in the different densities of the vapours of alcohol and chloroform, that of the former being 23, while that of chloroform is nearly 60. I think, however, that the test as above described, without the trouble of a distillation, is sufficiently delicate for all practical purposes, and that it will commend itself in that form especially to pharmacists, on account of its simplicity and ease of application.

A third paper, by the same author, was a—

NOTE ON THE SPECIFIC GRAVITY OF LIQUIDS.

By L. SIEBOLD, F.I.C., F.C.S.

While the great usefulness of the hydrometer for the rapid determination of the specific gravity of all kinds of clear liquids is universally recognised, there appears to be anything but unanimity of opinion as to the value of this instrument as an indicator of the specific gravity of mixtures owing part of their weight to the presence of undissolved or suspended matter. I have therefore made a number of experiments with the object of deciding whether or not the indications of the hydrometer may be depended upon in the case of mixtures containing insoluble powders, oils, resins, etc., uniformly suspended. The results were as follows:—

Mixtures of Precipitated Chalk, Mucilage of Acacia, Syrup, and Water.

		Specific gravity by hydrometer.		Specific gravity by balance.
No. 1.	. . . . .	1.106	.	1.1066
„ 2.	. . . . .	1.070	.	1.0710

Mixtures of Magnesia, Mucilage, and Water.

		Specific gravity by hydrometer.		Specific gravity by balance.
No. 1.	. . . . .	1.059	.	1.0598
„ 2.	. . . . .	1.036	.	1.0359

Mixture of Precipitated Chalk and Water only.

Specific gravity by hydrometer.	Specific gravity by balance.
1.037	1.0396

The difference in this case arose from the fact that it was impossible to read off the specific gravity quickly enough, for in the absence of mucilage or any other binding substance, the chalk began to subside immediately after shaking, thus causing a continual decrease in the specific gravity.

Mixtures containing subnitrate of bismuth, heavy spar, and other mineral powders, each suspended by mucilage, were tested in the same manner, and likewise gave concordant results.

Emulsions of Oil of Almonds, Gum Acacia, and Water.

		Specific gravity by hydrometer.		Specific gravity by balance.
No. 1.	. . . . .	1.010.	.	1.0110
„ 2.	. . . . .	1.007	.	1.0070

Emulsion of Copaiba, Mucilage, and Water.

Specific gravity by hydrometer.	Specific gravity by balance.
1.014	1.0144

Various Samples of Milk.

	Specific gravity by hydrometer.	Specific gravity by balance.
No. 1.	1.030	1.0305
„ 2.	1.028	1.0278
„ 3.	1.032	1.0316
„ 4.	1.029	1.0300

Official Mucilage of Acacia.

Specific gravity by hydrometer.	Specific gravity by balance.
1.165	1.1670

The last determination was made in order to see whether the great viscosity of the liquid would have any notable effect on the indications of the hydrometer.

All the determinations were made at 62° F. The set of hydrometers used consisted of instruments specially made for very short ranges of specific gravities, the correctness of which I had frequently checked in previous determinations.

The foregoing experiments prove that carefully made hydrometers afford reliable indications of the specific gravities of liquids, no matter whether their gravity is due to dissolved or suspended substances.

The PRESIDENT having invited discussion on these three papers—

Mr. MARTINDALE asked a question as to the detection of chloroform in dichloride of ethidene.

Mr. C. UMNEY much admired as a chemist the simple test for detecting the presence of minute quantities of alcohol in chloroform. But the Pharmacopœia recognised the presence of 1 per cent. of alcohol in chloroform of trade, and they as pharmacists must not encourage the idea that chloroform was not medicinally pure because the specific gravity was 1.490. The accuracy of this statement could be checked by calculating the specific gravity of a mixture of 100 parts of chloroform at 1.500 and 1 part of alcohol at .795.

Mr. E. C. C. STANFORD said in using chloroform he did not know whether the presence of alcohol did not very often give a disagreeable colour to the iodine solution. He had now discarded it

for some years, and used nothing but bisulphide of carbon. That was an exceedingly good method of testing certain substances, such as kelp, where the actual amount of iodine was not more than 0·5 per cent.

Professor ATTFIELD asked Mr. Siebold whether there really was any adulteration in powdered drugs; his own experience was that there was little or none.

Mr. REYNOLDS referred to the use of chloroform for testing drugs, and mentioned that he had by this means easily ascertained that the active constituent of an anthelmintic lozenge was santonin.

Mr. SIEBOLD said he had observed adulterations of powdered drugs during his experiments, but not many, and in order to see to what extent the test might prove available, he had himself adulterated most of the drugs experimented with. With regard to the solubility of alkaloids and some other constituents of drugs, alluded to by one of the speakers, he said that in every case in which chloroform dissolved anything from the substance under examination, it was necessary of course to wash the sediment with chloroform before drying and weighing it. He thought this mode of separating mineral from light organic substances might also prove valuable in certain toxicological analyses. Respecting the purity of commercial chloroform, he stated that among the samples he had examined those manufactured in this country were, on the whole, very pure.

A vote of thanks to Mr. Siebold for his papers was passed.

The last paper read at this sitting was on—

THE EXTRACTION OF PILOCARPINE.

BY A. W. GERRARD, F.C.S.,

Demonstrator of Materia Medica at University College.

Having during the past year worked some large quantities of the leaves of jaborandi (*Pilocarpus pennatifolius*) for the alkaloid pilocarpine, I on three occasions varied my process with the view of obtaining the most economical results.

Exhaustion of the leaves with water instead of alcohol was tried and abandoned, as the volume of water required for a thorough exhaustion was so large as to necessitate the employment of much time and unnecessary heat in its evaporation; and moreover the

large yield of extractive, most of which was albuminoid, required considerable and prolonged washing with alcohol to free it entirely from commingled alkaloids.

A process similar to that adopted by Wright for exhausting aconite root, viz., treating the root with alcohol acidified with tartaric acid, was tried with the jaborandi leaves; the presence of the acid did not in any way influence the process or result, neither to its advantage nor disadvantage, simple alcohol being equally efficient as a solvent.

In my first process for the preparation of pilocarpine (*vide Pharmaceutical Journal*), I found on treating the concentrated washings of the alcoholic extract with ammonia instead of potash, that much brownish black colouring matter subsided, freeing the mother liquor from a very objectionable accompaniment; this observation several times repeated led me to believe that ammoniated alcohol might be with advantage substituted for ordinary alcohol as the solvent of the pilocarpine. Another reason why I considered the use of ammonia might prove advantageous, was that most salts of pilocarpine are only sparingly soluble in cold alcohol, but the hydrate is freely soluble, and in the percolation of the ammoniated spirit through the drug, the ammonia would liberate the alkaloid, which would be freely taken up by the alcohol. Tested on a small scale this process was successful, and the experiment was repeated upon 100 lbs. of jaborandi leaves as follows: 84 per cent. alcohol was treated with 1 per cent. of strong solution of ammonia, and the leaves percolated to exhaustion with this solvent, the alkaline alcoholic percolate was made neutral with tartaric acid, the alcohol distilled, and the residue treated with excess of ammonia and alcohol, again distilled and the pilocarpine dissolved out from the residue with chloroform, converted into nitrate and crystallized to purity from boiling absolute alcohol.

The yield of alkaloid by the above process was greater than I had previously attained by other methods of working upon the same sample of leaf; the yield being 7 per cent., and the ammonia (as I inferred it would) effectually liberated the pilocarpine, so that a comparatively small volume of alcohol was required for its solution, also leaving behind the brownish black colouring matter. The contact of free ammonia with the alkaloid during percolation might be objected to as likely to produce decomposition. This does not appear to be the case judging by the yield.

To purify the nitrate of pilocarpine, which is by far the best and most convenient salt for medicinal use, it is usual to boil the crude

brown coloured salt of the first crystallization with absolute alcohol, and set aside for a few hours, when the separated crystals may be thrown on a filter and washed with cold alcohol until colourless; the mixed washings will by further treatment yield a further supply of crystals, and the process may be carried on until at last will be obtained a viscous dark brown mass, still containing alkaloid but no longer crystallizing. This residue is best worked up by treating with a large volume of water, and allowing to stand for twenty-four hours, when the larger part of the colour separates in flocks, falling to the bottom of the vessel; the solution now evaporated will again crystallize, and the crystals can be treated as before mentioned.

The percentage of pilocarpine in different samples of jaborandi is very variable, one specimen yielding me only '03 per cent., whilst from others I have obtained '3, '5, '7 per cent., the leaf giving the lowest percentage possessed the true characters of *Pilocarpus pennatifolius*, except that it was much thinner. I was unable to trace its source, but the differences I have alluded to lead one to think that it may be a second variety or grown in a different locality than that from whence we obtain our regular supplies of jaborandi. At any rate it is important to know that there are inferior qualities of the drug, which if used in making tinctures, extracts, etc., would possess but little therapeutic value; and this is an additional argument for the use of definite principles in medicine, such as is found in the alkaloid pilocarpine, which is one of the most powerful and certain diaphoretics known in materia medica.

Mr. MARTINDALE said, that having worked at pilocarpine, he thought he might have a prior claim to Mr. Gerrard for having first purified the crude crystals of nitrate of pilocarpine. Mr. Gerrard read a paper and showed specimens of nitrate of pilocarpine at the Bristol meeting. The crystals exhibited were contaminated with uncrySTALLIZABLE matter. Towards the end of 1875, he (Mr. Martindale) worked some bark and stem of jaborandi, from which he got two drams of crude pilocarpine, and on January 18, 1876, experimenting with this, he dissolved it in one ounce of absolute alcohol, and added fifteen minims of nitric acid previously diluted with fifteen minims of distilled water. The small crystals separated readily and were purified by pouring off the spirit, by dissolving in boiling absolute alcohol, from which they separated free from colour. A quarter of a grain administered by the mouth produced the usual perspiration and salivation in forty minutes. The action was over in three hours.

A physiologist who had worked a great deal at the subject had informed him lately that pilocarpine did not produce all the actions of *jaborandi*. It possessed the sialogogue and diaphoretic properties, but did not produce the same action on the heart as the extract of *jaborandi*. This was probably the effect of a second alkaloid. He should have liked to have asked Mr. Gerrard if he had sought for this in the uncrystallized residues in making nitrate of pilocarpine.*

Mr. WILLIAMS said Mr. Gerrard had suggested a new and very important process, and they ought to thank him very much for his discovery, by which they could get a better yield at a smaller expense of spirit. Not only was credit due to him for this discovery, but for the liberality with which he had made it known.

A vote of thanks was passed to Mr. Gerrard for his paper, and the first day's sitting of the Conference terminated.

The proceedings on Wednesday morning were commenced by the reading of a paper entitled—

NOTES ON PETROLEUM SPIRIT OR "BENZOLINE."

BY ALFRED H. ALLEN, F.I.C., F.C.S.

Although it is well known to professional chemists that petroleum spirit is composed of hydrocarbons quite distinct from those constituting coal-tar naphtha, among the general public, and to a certain extent among people possessed of some knowledge of chemistry, great confusion has arisen as to the nature of the liquids known in commerce as "benzine," "benzene," "benzol," and "benzoline." Of these, the hydrocarbon *benzol* or *benzene*, C_6H_6 , is the chief and characteristic constituent of coal-tar naphtha, while it is present in very insignificant amount in petroleum spirit or mineral naphtha. The terms *benzine* and *benzoline* have no scientific application, and are merely commercial names for petroleum spirit. It is owing, in a great measure, to the similarity of these names to those of the chief constituent of coal-tar naphtha that confusion has occurred; but it has been made far worse by the accidental or intentional substitution of one liquid for the other, until it is difficult to obtain the coal-tar product retail, even when it is asked for by its proper name. This would be of but little consequence if the two liquids were of exactly similar nature; but in certain cases they present decided differences

* For a reply, *vide Pharmaceutical Journal*, Oct. 11th, 1879.

of behaviour, although in general characters there are very close resemblances.

The following tabular statement of the characteristic differences between petroleum spirit and coal-tar naphtha has been compiled from various sources, and includes a few original tests. All the characters given have been carefully verified by actual experiment on representative samples of commercial petroleum spirit and coal-tar benzol.

Petroleum Spirit, "Benzoline," or "Benzine."	Coal-tar Naphtha, or "Benzol."
<ol style="list-style-type: none"> 1. Consists of <i>heptane</i>, C_7H_{16}, and its homologues. 2. Heptane contains 84.0 per cent. of carbon. 3. Burns with a somewhat smoky flame. 4. Commences to boil at 54° to 60° C. 5. Specific gravity about .69 to .72. 6. Smells of petroleum. 7. Dissolves iodine, forming a solution of a raspberry red colour. 8. Does not sensibly dissolve pitch, and is scarcely coloured by it, even on prolonged contact. 9. When shaken in the cold with one-third of its volume of fused crystals of absolute carbolic acid, the latter remain undissolved. 10. Requires two volumes of absolute alcohol, or four or five volumes of methylated spirit of .828 specific gravity for complete solution at the ordinary temperature. 	<ol style="list-style-type: none"> 1. Consists of <i>benzene</i>, C_6H_6, and its homologues. 2. Benzene contains 92.3 per cent. of carbon. 3. Burns with a very smoky flame. 4. Commences to boil at about 80° C. 5. Specific gravity about .88. 6. Smells of coal-tar. 7. Dissolves iodine, forming a liquid having the colour of a solution of potassium permanganate. 8. Readily dissolves pitch, forming a deep brown solution. 9. Miscible with absolute carbolic acid in all proportions. 10. Miscible with absolute alcohol in all proportions. Forms a homogeneous liquid with an equal measure of methylated spirit of .828 specific gravity.

Although the foregoing tests are abundantly sufficient for the distinction of petroleum spirit and benzol, when applied to mixtures of the two products they are of but little value even as qualitative indications, and in that case the density is the only one of the above characters which is capable of giving even an approximation to the quantities in which the constituent liquids are mixed.

The action of nitric acid on coal-tar naphtha is well known to result in the formation of nitrobenzene and its homologues, and has been employed by Schorlemmer for detecting traces of benzene, etc., in petroleum. On the other hand, the action of nitric acid on the hydrocarbons of the paraffin series, which constitute practically the

whole of petroleum spirit, is almost *nil* in the cold, even if fuming acid be used, and is very limited in extent if hot acid be employed, provided that the very strongest be avoided. I found by experiment that the action of nitric acid on petroleum spirit was, under certain conditions, even more limited than I had supposed; and eventually I found that by employing the acid in a particular manner, it was not only possible but easy to effect a tolerably perfect quantitative separation of coal-tar naphtha and petroleum spirit.

The following was the mode of treatment eventually employed, and, by adhering to it, it is possible to detect and approximately estimate the proportion of petroleum spirit existing in a mixture of it with benzol, in ten or fifteen minutes:—

A known measure of the sample (from 4 to 6 c.c.) was treated with four times its measure of yellow nitric acid of 1.45 specific gravity. The mixture was made in a flask, to which a condensing arrangement was attached. Slight heat was applied externally by means of a flame if the spontaneous action was not sufficiently vigorous. After about five minutes the contents of the flask were cooled, and then poured into a narrow, graduated tube. Any oily layer was measured and removed with a pipette, and the remaining liquid poured into a large excess of water.

When ordinary petroleum spirit is thus treated, the nitric acid becomes coloured more or less brown. Very little heat is evolved, but on applying moderate heat externally the production of red fumes proves the occurrence of a certain amount of action. The effect, however, is not so violent as I had anticipated from a perusal of Schorlemmer's description of the reaction, and, if the experiment be carefully made, the petroleum spirit employed forms a layer on the nitric acid, and on transferring the liquid to a graduated tube is found to occupy the original volume of the sample used. This is true whether petroleum spirit alone be operated on, or whether it be previously mixed with various proportions of coal-tar naphtha. If the proportion of the latter be large, the quantity of nitrobenzene formed is larger than can be retained in permanent solution in the nitric acid. This fact causes no inconvenience, for the nitrobenzene forms a separate layer below the petroleum spirit, and in presence of nitric acid is not miscible with it. Nitrobenzene and petroleum spirit are perfectly miscible alone; but on shaking the mixture with strong nitric acid, the nitrobenzene is dissolved out. It will be seen, therefore, that the reaction with nitric acid may be conveniently employed for the determination of petroleum spirit in admixture with benzene. Very fair approximate results

are obtainable. If the layer of petroleum spirit be removed with a pipette, and shaken with water to remove dissolved nitrous fumes, it is obtained in a suitable condition for further examination.

If, after removing the layer of unacted-on petroleum spirit, the nitric acid solution be poured into water, a very sensible turbidity is usually produced, even with petroleum spirit free from coal-tar products, and on filtering off the precipitate, or allowing it to settle, and decanting the liquid, distinct evidence of the formation of nitrobenzene is obtainable by the aniline test. When the more volatile portion of petroleum spirit is thus treated, the nitric acid is scarcely coloured at all, and hardly a trace of milkiness is produced when the acid is poured into water. The brown colour and turbidity on dilution increase with the boiling point of the sample of naphtha, and are strongest with kerosine oil; but in all cases in which petroleum products are treated with nitric acid, the quantity of precipitate on dilution is very insignificant. Although nitrobenzene is recognisable among the products of the action of nitric acid on petroleum spirit, as was shown long since by Schorlemmer, I do not think the turbidity produced on dilution is due solely to its formation. It is probably rather due to the production of various nitro-substitution products, as it is well known that the higher numbers of the paraffin series are far more readily acted on by nitric acid than their lower homologues.

I have attempted to determine the proportion of benzene in a mixture with petroleum spirit, by measuring the nitrobenzene produced, but the results have not been satisfactory, partly in consequence of the solubility of nitrobenzene in water and acid liquids. By employing 250 c.c. of water for dilution, allowing the nitrobenzene to settle completely, decanting the greater part of the water, and pouring the "bottoms" into a graduated tube, the nitrobenzene may be readily measured. If an allowance of 1.5 c.c. be made for solubility in the one-quarter litre of acid liquid, the measure of benzene present in the sample taken may be roughly ascertained by multiplying the number of c.c. of nitrobenzene obtained by the factor 0.85. Thus if V be the volume in c.c. of nitrobenzene, then the benzene in the amount of sample taken was $(V + 1.5) \div 0.85$. The method is not capable of giving accurate results, but may be useful in some cases as a check on the determination of petroleum spirit by measurement of the layer insoluble in nitric acid.

With a view of learning something respecting the proportion of heptane present in ordinary petroleum spirit, I made a mixture in

equal measures of four samples of commercial "benzoline," such as is used for sponge lamps. This mixed specimen had a density of $\cdot 7001$ at $15\cdot 5^{\circ}\text{C}.$, and commenced to boil at about $54^{\circ}\text{C}.$ It was distilled in the manner first described by Warren, in a flask furnished with an inverted condenser, filled with water, maintained at a temperature of $70^{\circ}\text{C}.$, a second condenser being kept well cooled by a current of cold water. The distillation ceased when the temperature in the flask was $84^{\circ}\text{C}.$, that is, $14^{\circ}\text{C}.$ above that of the first condenser. The water in the first condenser was then raised to the boiling point, and the distillation continued till scarcely anything more came over, by which time the contents of the flask were at $114^{\circ}\text{C}.$ The result of the distillation was as follows—for 100 measures of petroleum spirit taken:—

	Condensed below $70^{\circ}\text{C}.$	Condensed between 70° and $100^{\circ}\text{C}.$	Condensed above $100^{\circ}\text{C}.$ (residue).
Percentage by measure. . . .	16	56	26
Density at $15\cdot 5^{\circ}\text{C}.$, compared with water at same temperature .	$\cdot 667$	$\cdot 707$	$\cdot 742$

The loss was about 2 per cent. of the original measure. Another specimen of petroleum spirit gave $22\frac{1}{2}$ measures of distillate with the receiver at $70^{\circ}\text{C}.$, 42 per cent. between 70° and $100^{\circ}\text{C}.$, and 32 per cent. of residue; the loss being $3\frac{1}{2}$ per cent. The densities of the three products were almost identical with those previously obtained.

The observed specific gravities of the first and second distillates correspond approximately with the recorded densities of hexane and heptane, and from this and the known boiling points of these liquids it is evident that the portion of petroleum spirit not condensed at $70^{\circ}\text{C}.$ will consist chiefly of hexane and lower homologues; while the part condensed at $70^{\circ}\text{C}.$, but distilling at $100^{\circ}\text{C}.$, will be chiefly heptane and isoheptane. As in the experiments described this fraction measured from 42 to 56 per cent. of the entire spirit, it is evident that the proportion of heptane present equals if it does not exceed that of all the other constituents.*

* The physical properties of the benzoline examined by me are very different from those attributed to the liquid by Wiederhold, who on fractionally distilling benzoline of $\cdot 715$ sp. gr., which commenced to boil at 60° , obtained:—

48.6 per cent.	of $\cdot 70$ sp. gr.,	boiling at 100° .
45.7	"	$\cdot 73$ " " 200° .
5.7	"	$\cdot 80$ " " above 200° .

The PRESIDENT said Mr. Allen's paper was an exceedingly useful and able one, and invited discussion of it by those who had knowledge of this particular class of chemicals.

Professor TICHBORNE (Dublin) said the paper they had just heard represented a class of papers exceedingly valuable to the analytical chemist, papers dealing with questions bearing on the reactions and detection of admixtures in articles met with in commerce. He should be glad if Mr. Allen would answer two questions. Mr. Allen mentioned that the solvent action of benzole and American light oils were different as regarded pitch. He presumed Mr. Allen meant coal-tar pitch. There were many pitches. One used in road making in Ireland was a pitch procured as a residue in distilling these American oils, and it was probable that that pitch would behave in the same way as regarded the heptane as the coal-tar pitch would behave as regarded benzole, that was, it would be soluble. He wished to know whether Mr. Allen had tried any experiments as regarded the action of these two solvent bodies upon creosote, and whether there was any difference. They knew already that creosote was frequently adulterated with carbolic acid, and he desired to know if they had any means of distinguishing the adulteration by means of these solvents of creosote and carbolic acid.

Dr. SYMES said, with regard to the odour of the two bodies in question, although they appeared to be somewhat similar, they smelt quite differently. If they were at all compared, the odour was a very satisfactory test of the difference between the two, and if the admixture was agitated with water, there always seemed to be quite sufficient evidence, not of the quantity, but of the presence of petroleum spirit. The difference in the solvent properties was very great. In separating chrysarobine from araroba, the solvent powers of benzole were considerably greater than those of petroleum spirit, and a much larger yield was obtained. In exercising this great solvent property in this particular instance it perhaps produced a less pure product; but he had tried the solvent powers comparatively on some other bodies, and he thought it was exceedingly desirable to know thoroughly what they were using when they were supposed to use either petroleum spirit or benzole. A quantitative test which would readily determine the proportions in which the two had been mixed would doubtless prove valuable.

Professor ATTFIELD said some varieties of petroleum were so highly cleaned that he questioned if they would be detected in benzole by their odour.

Mr. J. T. DOBB said Mr. Allen in his statement had referred to pitch. He should like to know if the kind of pitch that was used to ascertain the solubility was Swedish, Stockholm, or mineral pitch. The gentleman who had previously addressed them spoke of pitch as a product of petroleum spirit from America, and used for roads only in Ireland. He found that in the distillation of tar the residue was pitch, commonly and commercially called mineral pitch. He had found himself that it was only partially soluble in petroleum spirit; but was perfectly soluble in coal-tar naphtha. He wished to ask Mr. Allen what kind of pitch he used to ascertain the solubility of petroleum spirit and the solubility of coal-tar naphtha.

Mr. ALLEN, in reply, said he was very glad gentlemen had called his attention to the kind of pitch he used. He certainly ought to have explained that he used coal-tar pitch. It seemed probable, as Professor Tichborne had suggested, that pitch from petroleum would dissolve in petroleum spirit better than the other. He might add that anthracene, one of the most characteristic constituents of coal-tar pitch, was much more soluble in benzole than in petroleum spirit. He had not made any experiments on wood pitch or petroleum pitch. He had never seen any petroleum pitch, and he would like to obtain a sample. In a paper, written by himself, that appeared in the *Year-Book*, he had said, "Absolute carbolic acid dissolves half its volume of petroleum spirit, forming a clear liquid. On addition of a larger portion of petroleum spirit precipitation occurs. With one volume of carbolic acid and three of petroleum spirit, the layers have about the same measures as the original liquid. Each layer, however, contains both liquids, as may be proved by cooling the tube with a freezing mixture (or by wrapping filter paper round it, and dropping ether on the outside) when carbolic acid crystallizes out. Absolute carbolic acid is permanently soluble in about ten measures of petroleum spirit at 15.5°C. ($=60^{\circ}\text{F.}$)."

When carbolic acid was shaken with petroleum spirit it must not be supposed that the layers which separated consisted of the original liquors. Each was a solution of the one in the other. With ten measures of petroleum spirit to one of carbolic acid complete solution took place at ordinary temperatures. The solubility was enormously increased by rise of temperature, so that carbolic acid and hot petroleum spirit were miscible in all proportions.

Mr. Allen was thanked for his paper.

The next paper read was on—

THE VALUATION OF CITRATE OF IRON AND QUININE.

By FREDERICK W. FLETCHER, F.C.S.

Notwithstanding the large number of papers which have been published during the last few years on the estimation of quinine in the Citrate of Iron and Quinine of the British Pharmacopœia, there still appears to be a lack of trustworthy information upon one point in the process which ought by no means to be overlooked. Recorded observations have hitherto been confined, with scarcely an exception, to the determination of the total alkaloid present in the citrate, without regard to its purity as quinine. That such should have been the case is not, however, surprising, when it is remembered that, until recently, the separation of quinine from some other cinchona alkaloids closely resembling it in their behaviour to certain solvents was a matter of extreme difficulty. But the process described by Dr. Paul, in the valuable paper which he communicated to the Pharmaceutical Society at an evening meeting in February, 1877,* may be said to have revolutionized the subject of quinine analysis. In that paper, it will be recollected, the author stated that a sample of sulphate of quinine, containing an admixture of no less than thirty per cent. of sulphate of cinchonidine might, if examined by the Pharmacopœia test, be passed as pure quinine. That this astonishing statement was well grounded, any one who has since interested himself in quinine analysis can testify. Nor indeed was the possibility of such an extensive adulteration a matter of fancy. Not long since I met with a parcel of German quinine containing over twenty-five per cent. of sulphate of cinchonidine, and the opinions of those most competent to judge, confirm my own experience that from ten to fifteen per cent. of cinchonidine is invariably present in certain brands of foreign quinine.

The question now arises, whether if such sulphate is used in the manufacture of citrate of iron and quinine, the Pharmacopœia test will detect the cinchonidine? The reply, as might have been expected, is in the negative. The alkaloid obtained from the citrate in the manner directed in the Pharmacopœia will dissolve in pure ether, even though 25 per cent. of its weight is cinchonidine. But this is not all. The process of extraction of the alkaloid by ether, which has now superseded the characteristically indefinite official test, will not eliminate cinchonidine, for the same reason that it fails to

* *Pharm. Journ.* [3], vol. vii. (1877), p. 653.

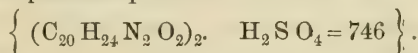
do so when applied to sulphate of quinine. It is therefore necessary to have recourse to some other method. The process which I have devised for the purpose, and which I have found to succeed remarkably well, is simply an adaptation of Dr. Paul's plan of fractional crystallization. It is exceedingly easy of application, and although a considerable quantity of the citrate has to be operated upon, there is little or no loss of quinine, most of the alkaloid being recovered as sulphate. It has, moreover, the advantage of combining three operations in one, as the results indicate:—(1) The exact amount of anhydrous alkaloid; (2) The proportion of the latter which can be converted into crystallizable sulphate of quinine; and (3) The percentage of alkaloids other than quinine.

The operations involved are briefly as follows:—Place 20 grams of the citrate in a 100 c.c. flask, dissolve in 50 c.c. of distilled water, and add gradually an excess of ammonia (.960), shaking well after each addition. This is important, in order that the quinine may separate in a state of fine division, as otherwise it is apt to be thrown out in tough lumps, difficult of subsequent solution. Pour in 25 c.c. of washed ether, and agitate with a rotatory motion till the alkaloid has completely dissolved. Transfer the mixture to a small glass separatory funnel, and having run the lower stratum of liquid back into the flask, pour the ethereal solution into a 100 c.c. platinum capsule. Treat the liquid in the flask with 20 c.c. more ether, and proceed as before. Repeat this operation a third time. The capsule containing the mixed ethereal solutions is then placed in a saucer of water, and the ether blown off by a current of air from a Fletcher's bellows. This immersion of the capsule in water obviates the tendency of the ether to creep up the sides. The platinum dish, which will now contain a pasty residue, is next placed in the air bath, previously heated to 120° , and in fifteen minutes desiccation is complete. After cooling in an exsiccator, the capsule is covered and removed to the balance. The weight, minus that of the capsule and cover, multiplied by 5, is the percentage of total alkaloid. I may mention that having made many hundreds of analyses by this process, I can testify to the accuracy of the results obtained. In cases where a determination has been repeated, I have never found the results to vary more than 0.1 per cent. When an estimation of total alkaloid only is required, 2 grams of citrate is a sufficient quantity to operate upon.

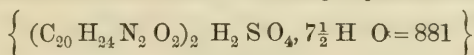
The anhydrous alkaloid is now to be converted into basic sulphate. Since a molecule of the latter salt contains 648 parts of quinia to 98 parts of sulphuric acid, and as decinormal sulphuric acid contains

4.9 grams of $\text{H}_2\text{S O}_4$ per litre, it follows that 1 gram of anhydrous quinia will require 30.86 c.c. of decinormal sulphuric acid to effect its conversion into basic sulphate. The weight of anhydrous alkaloid in grams is, therefore, multiplied by 30.86, and the number of c.c. of decinormal sulphuric acid thus indicated are run into the platinum capsule from a burette, and the former being placed on wire gauze over the flame of a rose burner, the contents are briskly stirred until the alkaloid is all taken up and a clear solution obtained. This is then transferred to a flask and allowed to cool spontaneously. The crystalline mass which will then have formed is thrown on to a small calico filter, about three inches square, stretched over a beaker, and, when drained, tightly squeezed to remove the last few drops of liquid. The latter is then filtered into a stoppered graduated tube of about 150 c.c. capacity, and its volume noted. 20 c.c. of washed ether and an excess of ammonia are then introduced, and the whole, after being well agitated, is set aside for six hours.

In the meantime the squeezed residue is detached from the calico filter, dried in the air bath at a temperature of 100°C ., and weighed as anhydrous sulphate of quinine—



To express the result in terms of ordinary crystallized sulphate,



the weight found is multiplied by $\left(\frac{881}{746} = \right) 1.18$. To this is added the amount of the latter contained in the mother liquor which has been separated (and which may be estimated to contain 1 part in 750), and the total will then represent the proportion of anhydrous alkaloid which can be converted into sulphate.

At the expiration of the time mentioned, the tube which has been set aside is examined, when the cinchonidine and quinidine present will be found to have crystallized out at the junction of the two liquids. The stratum of ether is removed by a small Nessler pipette; the crystals washed with two successive portions of 10 c.c. of ether, the last few drops of which can be absorbed by a little roll of filter paper. The crystals are then thrown upon a double-tared filter, made of two papers weighed one against the other, dried at 120° , and placed on the balance, the outside paper acting as a counterpoise. In practice I find that the weight of this first crop of crystals represents on an average two-thirds of the total

cinchonidine or quinidine present. If, therefore, the amount does not exceed .1 gram the percentage of these alkaloids may be estimated to be below 5 per cent. Should the first weighing exceed this limit, the sulphate obtained from the first crystallization must be dissolved in 100 c.c. boiling water, and treated as before, the weight of alkaloid separated by ether being of course added to the amount first obtained.

As thus described, the process may seem tedious, but in reality it is not so. Not counting the time which must be allowed for crystallizing, the entire estimation may be completed in something under two hours. The method, of course, does not distinguish between quinidine and cinchonidine, the usual tests for which must be applied to the solution of the mixed sulphates. This, however, is a point of minor importance, as the question of chief interest for the pharmacist is the determination of the exact amount of pure quinine present in the citrate. Two examples will be sufficient to illustrate the working of the process:—

(A) 20 grams citrate taken. Yield of anhydrous alkaloid—extracted as above, by ether, and dried at $120^{\circ}\text{C}.$, = 2.67 grams, or 13.35 per cent. The number of c.c. of decinormal sulphuric acid required to convert it into sulphate was therefore $(2.673 \times 0.86 =)$ 82.5 c.c. This volume was run in from a burette and the alkaloid dissolved in the manner described. When cool, the filtered mother liquor, which measured 85 c.c., was treated with ether and ammonia. The first crop of crystals of cinchonidine weighed when dry .113 gram, the second .06 gram, therefore $\frac{(.114 + .06) \times 100}{2.67} = 6.4$, which

represents the percentage of cinchonidine in the total alkaloid. The sulphate obtained in the first crystallization weighed, when dried at 100° , 2.67 grams, or $(2.67 \times 1.18 =)$ 3.1 grams of ordinary crystallized sulphate. On adding to this the amount present in the 85 c.c. mother liquor, which will equal $\frac{8.5}{750} = .11$ gram, we get $(3.1 + .11 =)$ 3.21 grams of sulphate of quinine. The weight of anhydrous alkaloid found by experiment being 2.67 grams, would be equivalent to 3.6 grams of sulphate; the cinchonidine found represents .15 gram, so that the crystallizable salt would stand as 3.4 grams *found* against 3.6 grams *calculated*, proving the absence of any appreciable amount of amorphous alkaloid.

(B) 20 grams of citrate taken. Yield of anhydrous alkaloid, 3.06 grams, or 15.3 per cent. Weight of cinchonidine found, first crystallization, .120; second, .065 = $\frac{(.120 + .065) \times 100}{3.06}$ 6.04 per

cent. of the total alkaloid. The hot aqueous solution of the sulphate was sherry-coloured, and the sulphate which separated on cooling was very far from being white. It weighed when dry 2.46 grams, equal to $(2.46 \times 1.18 =)$ 2.9 grams crystallized sulphate. This amount, *plus* .113 gram, the quantity estimated to be present in 85 c.c. mother liquor, and .15 gram allowed for first crop of cinchonidine, gives a total of 3.16 grams of crystallizable salt. But the weight of anhydrous alkaloid found was 3.06 grams, equivalent to $(3.06 \times \frac{881}{648} =)$ 4.16 of crystallized sulphate; the difference of 1 gram must therefore be considered to be amorphous alkaloid—which would thus constitute over 30 per cent. of the whole.

Whether the presence of 5, 10, or 20 per cent. of cinchonidine would bring a sample of citrate of iron and quinine, which nevertheless answered the B. P. test, within the reach of the Adulteration Act, is a point upon which I offer no opinion. An eminent analyst, with whom I was lately discussing the subject, took the negative view. If such is really the case, a revision of the Pharmacopœia will come none too soon. The plausible excuse which is sometimes set up, that manufacturers cannot perfectly separate the cinchonidine from the quinine except at a greatly enhanced cost, is utterly without foundation. The white sulphate manufactured both by Messrs. Howard and Mr. Whiffen I have never found to give the slightest reaction with Paul's test, and what is a still more striking fact, the so-called unbleached quinine of the latter maker is frequently quite free from cinchonidine. Certain of the foreign makes are also, as a rule, unimpeachable in this respect; whilst on the other hand, some others are systematically adulterated.

It may be worth noting, as a matter of practical interest, that the substitution of 1 per cent. of cinchonidine for quinine, in the manufacture of citrate of iron and quinine, reduces the value $\frac{1}{2}d.$ per ounce for each such addition; and when it is remembered that the Pharmacopœia test will easily pass 20 per cent. of cinchonidine, and that the consumption of the citrate is considerably over 100,000 ounces per annum, the valuation of this preparation resolves itself from a chemical into a question of commercial interest.

The PRESIDENT said this was one of those useful practical papers the importance of which appealed to them, and as there were practical manufacturers of the article present, it would be interesting to hear what they had to say on the subject.

Mr. UMNEY said that the subject of citrate of iron and quinine

had for some years been of interest to him. In a paper by himself in the *Pharmaceutical Journal*, August 30, 1873, he endeavoured to show that the Pharmacopœia directions and its test for this salt were written in somewhat of a haze. Those who remembered citrate of iron and quinine in its infancy would bear him out that it was customary for the labels to bear the words "this preparation contains an equivalent of 25 per cent. of sulphate of quinine." Even latterly the same labels have been affixed, but to some the statement "that this preparation contains 16 per cent. of quinia" has been added. The compilers of the Pharmacopœia presumed that from one part of quinine sulphate they would obtain by the formula indicated four parts only of citrate of iron and quinine. Now as a manufacturer he knew that from 100 ounces of sulphate of quinine he could produce 445 to 450 ounces of citrate of iron and quinine. The starting point, therefore, was wrong, and it was absolutely impossible to get a preparation working by that formula that would contain the equivalent of 25 per cent. of sulphate of quinine. This had been pointed out in the *Pharmaceutical Journal*, and he had no doubt some alteration would in the next Pharmacopœia be made in this respect. The Pharmacopœia in directing the precipitation of the alkaloid limited them to the quantity of water. It prescribed that 50 grains should be dissolved in one ounce of water, and that the precipitate when dried should weigh eight grains. They were therefore to infer that it contained 16 per cent. of anhydrous quinia. Now the experiments of Mr. Fletcher would show that citrate of quinine and iron would not give 16 per cent. of anhydrous quinia. To obtain the alkaloid anhydrous they must resort to a temperature of about 225° F., and such heat must be continued for four or five hours, for at 212° F. the precipitate would for hours continue to lose weight. He maintained that the tests in the British Pharmacopœia wanted revising, or one day pharmacists might find themselves landed in great difficulty with gentlemen known as public analysts. It had been given on the authority of a public analyst, in the case Mr. Fletcher had mentioned, that a prosecution would be with a negative result. Another point required modification. Mr. Fletcher had referred to the dissolving of cinchonidine by ether. Had the Pharmacopœia limited the quantity of ether used, they might have prescribed the ether test with advantage. The question of the purity of the quinia precipitate was a very important one, for cinchonidine was now largely used, and was unquestionably a valuable remedy. He thought the paper was a most important one, and that the observations on the

revision of the Pharmacopœia were not the least important part of it.

Mr. A. H. MASON (Liverpool) said that whilst it was universally admitted that the Pharmacopœia test was faulty, it was quite possible to guard against trouble from public analysts by adding such a quantity of quinine to the formula as shall yield the desired percentage to the Pharmacopœia test, and this plan was adopted by some manufacturers.

Professor ATTFIELD said it was only fair to the editor of the British Pharmacopœia to say that at the meeting of the Conference in Glasgow that gentleman admitted that the quantitative test for quinine in citrate of iron and quinine was not all that could be desired, and thought that it was important to go a step further, so that they might arrive at more accurate results.

Dr. SENIER observed that it had been frequently pointed out that even in the cases where pure quinine sulphate was employed in the preparation of citrate of iron and quinine, a great loss occurred during precipitation and conversion into citrate. If therefore they followed the directions of the Pharmacopœia, it would be practically impossible for the scale preparation to contain the whole of the quinine commenced with. Indeed, the loss was frequently as much as 10 per cent. He wished to ask whether there was any objection, commercial or otherwise, to the use of quinine citrate to commence with. This would remove the question of loss from the pharmacist to the quinine manufacturers, who would be well able to deal with it.

Dr. SYMES said it had been shown in Mr. Fletcher's paper and the discussion—indeed, it had become a recognised fact—that the Pharmacopœia process strictly followed did not yield the product it described, and the tests given would not detect a considerable amount of impurity if present. Professor Attfield had stated that in justice to the editor of the work he should say that he was now aware of this. He (Dr. Symes) wished to remark that this being the state of things with regard to so important a preparation, it furnished further evidence of the necessity for a new edition of the Pharmacopœia, and he thought in justice to pharmacists this work ought to be proceeded with in a much more active manner than it appeared to be doing.

The PRESIDENT said he might be pardoned for the reflection that the discussion seemed to indicate how desirable it was that in the re-arrangement of the next Pharmacopœia pharmacists proper should be well represented. He hoped they would join him in a vote of thanks to Mr. Fletcher.

Mr. FLETCHER said he quite agreed with Mr. Umney that the B. P. test was most unsatisfactory, and as a manufacturer he could also endorse Mr. Umney's statement that citrate prepared strictly in accordance with the directions of the Pharmacopœia would not be found to contain 16 per cent. of quinine. With regard to what Mr. Mason had said respecting the 16 per cent. of alkaloid, it should be borne in mind that the Pharmacopœia method of weighing the alkaloid precipitated by ammonia was not intended to give anhydrous quinia. The precipitate was generally regarded as a trihydrate, 16 parts of which were equivalent to 13·7 parts of anhydrous quinia. He had verified this experimentally by adopting a slight modification of the process described in the *Pharmaceutical Journal* a few months since by Mr. W. Stevenson. Instead of dissolving the citrate in water, he dissolved it in a saturated aqueous solution of quinine, containing a very small quantity of ammonia. The quinine, precipitated in the usual way, was then thrown upon a double tared filter, washed free from iron by a further quantity of ammoniacal solution of quinine, and the precipitate dried without heat. Proceeding in this way, a sample of citrate which yielded to ether 13·7 per cent. of anhydrous quinia would afford very nearly 16 per cent. of air-dried alkaloid.

Mr. E. DAVIES, F.I.C., sent a paper, "The Estimation of Water in Iodine," which was read by Mr. Bengier.

THE ESTIMATION OF WATER IN IODINE.

By EDWARD DAVIES, F.I.C., F.C.S.

In endeavouring to discover a method for quantitatively determining the moisture in iodine several difficulties had to be overcome owing to the conditions laid down in the blue list, namely, that the process should be "handy and direct." By the first requirement I understand that it should be performed with such ordinary apparatus as may usually be found in a chemist's shop, that the manipulation should be easy and simple, and that the time should not be very long. The second requirement, strictly construed, is that the water should be weighed, and, so far, I cannot claim to have complied with it. All attempts to retain the iodine whilst the water passed on into an absorption tube were failures. The best was to volatilize the iodine in a current of carbon dioxide over clean iron filings gently heated. The apparatus was troublesome to put to-

gether, and practically it was impossible to heat the iron sufficiently to make it absorb the iodine without decomposing some of the water.

I was therefore driven to adopt an indirect method; and I think that the following process will answer the purpose satisfactorily:—

It consists in combining the iodine with mercury and weighing the resulting iodide. A small thin porcelain dish, about $2\frac{1}{2}$ inches in diameter and weighing about 250 grains, is fitted with a small glass pestle, made from a piece of solid glass rod, 3 inches long and about $\frac{3}{16}$ thick, by heating one end in the blowpipe flame until soft, and then pressing it on the bottom of the dish so that it may have the same curvature. About 60 grains of dry mercury are put in the dish with the pestle, and the whole accurately weighed. Twenty grains of the iodine are then added, and a few drops of absolute alcohol to moisten it. The iodine and mercury are rubbed together until complete combination takes place, which is shown by adding a few more drops of alcohol, and allowing them to flow upon the side of the dish. If there is no free iodine the alcohol remains colourless. The rubbing requires about five or six minutes if much water is present, but only about one minute with dry iodine. The dish and its contents are now dried in a desiccator over sulphuric acid for twelve hours, and weighed. The loss of weight of the dish, mercury, and iodine, represents the amount of water contained in the iodine.

The residue must be dried at an ordinary temperature of the air, as mercury is far too volatile for a temperature of 212° F. to be used.

The iodine used in these experiments was resublimed and dried over sulphuric acid *in vacuo*. The mercury used was the commercial article, not quite pure. The following are some of the results obtained, from 60 to 80 grains of mercury being used in each case:—

	1.	2.	3.	4.	5.
Mercury, pestle, and dish	494.23	509.35	493.21	532.35	522.03
Resublimed Iodine	20.00	20.00	20.00	30.00	30.00
Water added	5.87	6.86	6.59	7.77	6.29
Total	520.10	536.21	519.80	570.12	558.32
Residue after drying	514.10	529.20	513.10	562.20	551.90
Water found	6.00	7.01	6.70	7.92	6.42
Excess . . . . .	.13	.15	.11	.15	.13

As these results showed a constant excess of about $\cdot 13$ grain, the iodine was examined with a view to ascertain if it contained water, which was retained on drying *in vacuo* over sulphuric acid. Two results gave:—

Mercury, pestle, and dish . . .	513·42	509·92
Iodine	20·00	20·00
Total	533·42	529·92
Residue after drying	533·42	529·92

The iodine being thus found to be free from moisture and the mercury also by the same experiment, the only explanation of the excess of loss which I can suggest is, that as five or six times as long is required to bring about the combination when water equal to about 20 per cent. is present, some of the iodine escapes with the alcohol vapour.

The drying was continued for twenty-four hours, and in some cases for forty-eight hours, but no perceptible loss was experienced after the first twelve hours.

The trifling excess, which would amount at the outside to $\frac{1}{2}$ per cent. in an excessively wet sample, and is absolutely nothing in dry iodine, cannot be considered a great objection to the process. A sample of resublimed iodine purchased in Liverpool contained 0·60 per cent. of moisture. A sample of commercial iodine contained 0·70 per cent.

Professor ATTFIELD remarked that he had made some experiments on the best means of estimating water in iodine, but he had not come to a very satisfactory conclusion. He believed the method adopted by those who used iodine tolerably largely was to expose a given weight of the iodine over sulphuric acid under a small bell-jar at as low a temperature as possible. No great amount of iodine escaped, and the loss suffered by the substance represented the amount of water present. That was a crude method, and he hoped they would arrive at a more exact one on the lines followed by Mr. Davies, namely, to endeavour to find some metal which would at, if necessary, a high temperature, and in large excess, absorb all the iodine, allowing the moisture to pass off in some way or other, and be collected and weighed. Hitherto he had found, that however large the excess of the metal might be, and whatever the amount of affinity of that metal for iodine, a little iodine did escape along with the moisture, and gave an inaccurate result. With regard to Mr. Davies' suggested defect in the process followed, namely, that a

little of the iodine itself escaped, and caused the percentage of water to appear too high, he thought many samples of iodine would give a loss due to another cause, namely, the presence of sulphuric acid. This would probably decompose iodide of mercury and form sulphate of mercury, an equivalent amount of iodine previously combined with the mercury passing off.

Mr. E. C. C. STANFORD was surprised to hear this spoken of as a new process. It was one he had adopted for several years; it was first suggested by Bolley, and would be found in Slater's "Commercial Analysis." His method was to use eight times the quantity of mercury, and to use it dry; they used five times the quantity, and found the process correct to 0.1 per cent. It was also rapid and convenient. Mr. R. R. Talloch, of Glasgow, used zinc, and had kindly sent him the details of the process employed:—Place a weighed quantity of the iodine in a weighed platinum capsule or small basin, in which has been placed a weighed quantity (say twice that of the iodine) of zinc sheet clippings, in size about one-eighth of an inch square; add a little water and move the capsule and contents gently about. Immediately the iodine acts upon the zinc, the first small portion of iodide of zinc produced dissolving the free iodine, which is thus presented to the zinc in a dissolved state. The fluid by-and-by becomes colourless, after which the contents are carefully evaporated to dryness, and the dry residue heated till it ceases to lose weight, taking care that no iodide of zinc is volatilized, which, however, is not easy. With the clippings the temperature does not rise beyond control. The dry residue which remains in the capsule is that of the zinc originally added, *plus* that of the dry iodine which has combined with a portion of it.

Professor TICHBORNE had used the process for many years, and he preferred that of drying over sulphuric acid. If a small bell-jar was used practically the process became correct, or nearly so; the error in the loss of the iodine would depend in a great measure on the size of the vessel in which the iodine was dried. As regarded the old process in connection with mercury, he might suggest that perhaps the best means of performing that would be to use a large excess of mercury, and to do it with a stopper bottle, shaking it up with the addition of alcohol. In that case there would be no loss from the volatilization of the iodine. In such a process as that detailed in the experiment, they must make every allowance, and determine separately the presence of bromine, cyanogen, etc.

Mr. FOSTER observed that he had had some little experience in

the estimation of iodine, and he had adopted the usual method; that was to expose a weighed quantity of iodine over sulphuric acid to which some iodine had been previously added, observing the precaution of having a very limited atmosphere in the way Professor Tichborne had pointed out. With these precautions he thought the ordinary process met the requirements of manufacturers, buyers, and sellers. The other processes, ingenious as they were, scarcely met the requirements of the case.

Mr. DRAPER asked what was the objection to the use of hyposulphite of soda.

Professor ATTFIELD explained that the use of hyposulphite of soda furnished a very good process when there were no other substances to be estimated.

A vote of thanks was passed to Mr. Davies for his paper.

The next paper read was on—

THE PRESENCE OF TANNIN IN GENTIAN ROOT.

By EDWARD DAVIES, F.I.C., F.C.S.

The paper on this subject by Professor J. M. Maisch, in the *American Journal of Pharmacy*, 1876, p. 117, would seem to have settled the question of the presence of tannin in gentian root in the negative. The researches of M. Ville, reported in the *Year-Book of Pharmacy*, 1877, p. 217, on the other hand, are directly contradictory in their result. The subject thus presents some interest, both with regard to the fact itself, and to the reason of the discordant results obtained in such an apparently simple matter. My first experiments were made on a sample of ground gentian root. A hot infusion was first made, but as it was impossible to get this perfectly clear, an infusion was made with cold water. This solution gave negative results; gelatine gave a very faint precipitate after long standing, tartar emetic with chloride of ammonium gave no precipitate, and ferric chloride only produced a slight darkening of the colour.

This appeared decisive, but I thought it better to test some of the unground root. A piece, which probably had been kept some time, was thinly sliced and digested with cold water for two or three days. The solution had a bright yellow colour, and although considerably less material had been used than in the previous one, it gave a decided precipitate with gelatine. I then obtained a quantity

of roots as fresh as possible, for which I am indebted to Messrs. Evans, Sons & Co., and made a cold infusion of the sliced root. In the liquid obtained gelatine gave a decided precipitate, acetate of cinchonine a large precipitate, tartar emetic small precipitate, ferric chloride distinct darkening of colour.

This result was so decided that I made an attempt to obtain an approximate determination of the amount of tannin. Making use of an improvement in volumetric analysis made by Mr. A. Haddock (*Chemical News*, 1879, April 10), consisting in the use of a mirror instead of the usual black glass plate, by means of which the faintest turbidity is shown, whilst the effect of colour is eliminated, a drop of the clear solution of the gentian root, 300 grains in 3000 of water, was put on a mirror, a drop of perfectly clear gelatine solution added, and a strong turbidity was produced. By the side of this a drop of a dilute solution of tannin was placed, and gelatine added to it. The tannin solution was diluted until the turbidity in the two drops was apparently identical. In this way the amount, of tannin was estimated at 0.08 per cent., two tests agreeing very closely.

It is possible that this trace of tannin is liable to decomposition when the root is powdered and so exposed to oxidation; or that it is not a constant constituent of gentian root. Either of these suggestions, if correct, will explain the discrepancy in the results obtained by competent observers.

The small quantity contained in the root renders its isolation a matter of great difficulty, and until it can be so separated the proof that the tannin in the root is gallotannic acid is only partial. So far as the tests show, they indicate gallotannic acid.

A vote of thanks was accorded to the author.

The next paper was a note on—

AMYLIC ALCOHOL AND AMYLIC NITRITE.

By D. B. DORT.

It was not my intention to write anything further on the subject of amylic nitrite, but a paper which has appeared in the *American Journal of Pharmacy*, by Dr. W. H. Greene, containing an adverse criticism of my contribution to the work of last year's Conference, almost necessitates some notice on my part. I think I ought to say

at the outset that Dr. Greene seems somewhat to have mistaken the nature and scope of my paper. It was intended more as a contribution to pharmacy than as a research in pure chemistry. Be that as it may, however, I have carefully gone over the same ground as last year, with the general result of substantiating what was then said. Dr. Greene's vague allegation of inaccuracy resolves itself on examination into three points, that is to say, I stated erroneously:—

1st. That amylic alcohol may be obtained boiling at 128° – 129° .

2nd. That nitrite of amyl does not distil at a constant temperature.

3rd. That nitrite of amyl decomposes when distilled.

As regards the first of these assertions, I have now proved its accuracy by more rigorous experiment than was formerly applied. Fusel oil from a large Scotch distillery was rectified at first roughly in a capacious flask, the portion passing over at 125° – 135° being retained. This was then distilled from chloride of calcium, and repeatedly rectified. No distillate was obtained at so high a temperature as 132° . If any small quantity of that boiling point existed, it must have been left behind in the syrupy solution of calcic chloride. It was soon found that the greater part of the above-mentioned fraction distilled at 128° – 129° . The portion obtained at these temperatures was rectified at 129° , but even after many distillations it still yielded 2 or 3 per cent., passing over at 128° . This liquid was mixed with caustic baryta and agitated therewith from time to time. After forty-eight hours the alcohol was distilled from fresh portions of baryta, but without any alteration in the boiling point, the calcic chloride having doubtless completely removed the water originally present. The liquid obtained in this way had the characteristic odour of amylic alcohol, and possessed the specific gravity of $\cdot 814$ at 60° F. A quantity of it was oxidized by means of potassic dichromate and sulphuric acid, the alcohol being mixed with the acid and the mixture dropped into the strong aqueous solution of the dichromate. The flask containing the solution was attached to a reversed condenser, and the solution gently boiled for two hours, after which the acid was distilled off. The distillate was neutralized with sodic carbonate, and evaporated to dryness; the residue mixed with sulphuric acid, and distilled. The valeric acid obtained was equal to about 20 per cent. of the alcohol used. The acid was converted into sodium salt, and the solution of the latter mixed with solution of argentic nitrate. The resulting valerate of silver was washed with cold water and dried in an exsiccator. By ignition—

6.170 grs. gave	.	.	3.125 Ag.	=	51.78 per cent.
9.035 „ „	.	.	4.686 „	=	51.85 „ „
			$C_5H_9AgO_2$	=	51.67 „ „ Ag.

When we consider this result, along with the circumstance that the alcohol in question yielded a product by the action of nitrous acid having the well-known properties of amylic nitrite, I think there can be no doubt that the liquid obtained from fusel oil at 129° was amylic alcohol. This is said with all the more confidence that my results agree exactly with those of Alexander Pedler, mentioned in his memoir on the valerianic acids (*Chem. Soc. Journ.* [2], vi., 74). It may be mentioned that the apparatus used, both in distilling the alcohol and nitrite, was essentially the same as that of Le Bel and Henninger, described and figured in the *Comptes Rendus* (vol. lxxiv., p. 480). It consisted of an ordinary three-bulb condensing tube, with a contraction under each bulb, so that the ascending vapours had to pass through portions of liquid before reaching the condenser.

We come now to the second statement previously referred to, viz., "That nitrite of amyl does not distil at a constant temperature." I never affirmed that it is impossible to prepare a nitrite of constant boiling point, but simply that I had found it impracticable to purify the medicinal nitrite to such an extent, and that therefore the Pharmacopœia test of a liquid boiling at 96° was one which the commercial nitrate could not reasonably be expected to answer. However, I think I am now in a position to state that even pure amylic nitrate does not distil at a constant temperature, in case it has been prepared from the 128° – 129° alcohol. A quantity of the nitrite was prepared by passing the vapours obtained by the action of nitric acid on starch through amylic alcohol (B. P. 128° – 129°). After saturation with the gas, the liquid was of a bright green colour. It was agitated with water, and after being separated therefrom was shaken up with anhydrous sodic carbonate. The product was now quite neutral to test paper, and had a specific gravity .881. On being distilled it evolved dense red fumes, and yielded 78 per cent. between 95° and 100° . This fraction was retained and shaken up thrice with solution of sodic carbonate in successive portions, and then with dry carbonate before being rectified. At the commencement of the distillation, red vapours were given off, and the first portions of distillate were strongly acid. The fraction 95° – 98° was retained and re-distilled, the portion coming over at 96° – 97° being collected apart. Very little was obtained at 96° , the greater part distilling between 96° and 97° . Can it be that the nitrites cor-

responding to the 128° and 129° alcohols boil at 96° and 97° ? After twelve rectifications, the nitrite had diminished to 20 per cent. of the original product, and even then did not distil entirely at 96° - 97° , the last three rectifications showing no increase in the percentage of the correct fraction. When this result is considered, along with the fact that the amylic alcohol had been rectified sixteen times, it will surely be admitted that it is not easy to obtain an amylic nitrite of nearly constant boiling point, and that such a process is out of the question for a pharmaceutical preparation.

Regarding the third statement, "That nitrite of amyl decomposes when distilled," I certainly think that a very fair inference from the phenomena observed. If a liquid which has been washed with an alkaline solution until quite neutral to litmus be distilled, and the distillate is strongly acid, it is manifest that decomposition has occurred; and this is just what takes place with amylic nitrite, at least with as pure a preparation as I have examined. In the twelfth rectification red fumes were evolved at first. Of course it is open to any one to say that some impurity may persistently adhere to the nitrite, which former, by its decomposition under the influence of heat, may evolve nitrous vapours. That may be quite within the bounds of possibility, though I do not think it is probable; but even supposing it to be the case, it only confirms my original assertion, which obviously referred to medicinal nitrite of amyl obtained at 90° - 100° , and not to a compound which (as then stated) I had never seen.

The PRESIDENT said the paper was a refutation of the charges brought against the author, and it struck him that Mr. Dott had succeeded in perfectly establishing his case.

Mr. WILLIAMS said he could to a great extent confirm the statements in the paper. In making nitrite of amyl he had had considerable experience in one or two of the points, and the fact of its decomposition by constant distillation he could quite confirm. With respect, however, to the statement concerning amyl alcohol, he thought there could be no question that it had a constant boiling point. A paper read a year ago contained another point which he should like to refer to, and that was that nitrite of amyl might have a higher boiling point than that given in the Pharmacopœia, and still be a justifiable and good pharmaceutical product for use; but he did not agree with that, and thought that as the higher boiling point might be due to the presence of other bodies, like

nitrite of caproyl, the nitrite of amyl used in medicine ought not to have a higher boiling point than that indicated in the Pharmacopœia.

Professor TICHBORNE also bore testimony to the decomposition of nitrite of amyl in distillation.

Mr. ABRAHAM said in these experiments one or two degrees of boiling point were matter of considerable importance. Did the the experimentalists take cognizance of the variation in barometric pressure, for half an inch would make about one degree variation in the boiling point?

Mr. MACKENZIE asked if nitrite of amyl became decomposed with keeping.

Mr. WILLIAMS thought perhaps it would keep any length of time if properly preserved; still it was questionable whether it was as good at the end of twelve months as at the end of one.

Mr. NAYLOR maintained that it could not be kept for any great length of time, and that he had known it turn acid when kept at a low temperature.

In reply to Mr. Williams, it was admitted by Mr. Naylor that the specimen spoken of had not been redistilled.

A vote of thanks was passed to Mr. Dott for his paper.

The following paper was then read on,—

THE GELATINIZATION OF TINCTURE OF KINO WITH A POSSIBLE REMEDY FOR ITS PREVENTION.

By THOS. H. BAMFORD.

One of the very subjects discussed at the evening meetings of the Pharmaceutical Society on its institution was the gelatinization of tincture of kino, introduced by Dr. Redwood, and the general opinion expressed was, that this tincture kept best in small corked bottles in preference to large stoppered and partially filled bottles. However this may be, it has always been a source of trouble to the dispenser, which would be greatly aggravated if the tincture was a more popular one with prescribers.

In the majority of establishments, along with other seldom-used preparations, it lies on a shelf in some out-of-the-way place, and on the second or third occasion of its being required, it is usually found to have become consolidated into a stiffish, translucent, pinkish jelly, very elegant in appearance, bearing as it does a tolerable resemblance to red currant jelly, but altogether useless as a medicine.

Then, if the dispenser be inexperienced and unaccustomed to this phenomenon, he begins a series of experiments in the hope of inducing the fickle tincture to assume its normal condition; the agency of heat and the addition of more spirit will sometimes induce it to leave the bottle, but hardly in a state of solution, and in this condition it should never be used by the conscientious pharmacist, since it would altogether fail in its action on the patient, as in passing into the gelatinous condition it likewise loses its astringency.

Pereira, in the article on kino in his "Materia Medica," dismisses the fact in a brief sentence, and accounts for it as follows:—"It is said that by keeping this tincture has, in some instances, become gelatinous and lost its astringency. When this occurred, probably the Botany Bay kino (the inspissated juice of the *Eucalyptus resinifera*) had been employed."

It is doubtful whether the use of inferior specimens of kino will account for the deterioration of the tincture, as I have seen samples of all kinds, made expressly and kept under what were supposed to be the most auspicious circumstances, fail entirely as regards their keeping qualities, and the experience of any practical dispenser will bear out the statement that nine out of ten tinctures of this gum will pass into the gelatinous condition with more or less rapidity.

In the *Pharmaceutical Journal* for 1842 is the above-named paper, entitled, "The Gelatinization of Tincture of Kino," and in this Dr. Redwood states as his opinion that the change is dependent on the conversion of the tannin into a partially insoluble substance, ulmic acid; and in the discussion which took place after the reading of the paper, a general opinion was expressed that this change was expedited by the contact of atmospheric air in partially filled bottles. Messrs. Bell, Morson, Ince, and other well-known pharmacists, took part in the discussion, and the general opinion seemed to be that to its storage rather than preparation were we to look for the means of combating its unfortunate peculiarity. A somewhat protracted acquaintance with a sample kept in an unusual manner convinced me that I had at last seen a perfect panacea for this failing. The sample in question has now been kept in its present position (this is written from notes made in 1876) about twelve or fourteen years, and is to all appearances as good as on the day it was received into stock. It was placed in an ordinary quart stoppered round, in such a position that it was necessarily taken up and dusted every morning, and consequently was well shaken every twenty-four hours; the bottle was likewise covered with blue paper so as to perfectly exclude the light. The bottle was never full

(possibly now there are 8 ounces in a 40-ounce bottle), so that it has always been in contact with air. When it is stated that it was procured from a London drug house some time between 1862 and 1864, and has been in its present position since that time, all that is known of its history has been told. My advice to any druggist who has been troubled with this tincture is to remove his stock of it into a position where it must necessarily get a daily shaking (that is amongst the bottles which are dusted daily), and also coat the bottle with blue paper.

As during fifteen years' experience this is the only tincture of kino I have seen keep for twelve months, I am convinced that I have brought a remedy to the notice of the British pharmacist.

P.S. (1879)—The experience above recorded has received strong confirmation from the fact that a fresh supply was obtained three years ago from a local (Liverpool) house, and turned into the same bottle, and remains to this present day in as good a condition as on the day of its reception into stock.

Mr. UMNEY thought before this question could be finally settled, experimenters must operate upon authentic specimens of kino. They had three distinct varieties that occasionally appeared in commerce. The official kino, the product of *Pterocarpus marsupium*, of the East Indies, the kino from *Pterocarpus erinaceus*, and the Australian, or eucalyptus kino, from the *Eucalyptus resinifera*. (See Hanbury's "Pharmacographia.") Any one in the habit of visiting the drug warehouses of London, where these imports were shown previous to sale, was able, after a little practice, to distinguish one kino from another by tasting and observing the effect upon the palate and saliva.

Mr. MACKENZIE said he had had great experience in the use of kino, and had no faith whatever in shaking it.

Mr. MARTINDALE was of opinion that much depended upon the age of the kino, as to whether it was astringent or not.

Mr. COTTRELL paid the London houses a high compliment for great intelligence and probity, but expressed the opinion that some of the samples of kino sent out were not perfectly pure.

Mr. BENDER referred to a paper read by Mr. George Ellinor at the Bradford meeting of the Conference in 1873, in which a liquor was recommended as a substitute for tincture of kino. If he remembered rightly, Mr. Groves on that occasion expressed the opinion that old kino yielded a tincture liable to pectization, whilst that which was fresh did not.

Mr. LONG thought the subject of tincture of kino a very interesting one. From the immense range of remedies they had to contend with, there were difficulties in keeping all their preparations in a proper state unless they had a very large practice, and he thought as new remedies were introduced that old and useless remedies should be knocked out.

Mr. HASSELEY said he had been familiar with kino for twenty-five years, and only recently had he seen a specimen of it gelatinized.

Mr. GREENISH said in a paper on this subject introduced nearly forty years ago by Professor Redwood, the same difficulties presented themselves as now had to be contended with. He hoped it would occupy a place upon the blue paper of the Conference, and that some pharmacist capable of undertaking the subject would ascertain whether gelatinization depended upon a particular kino or upon the age of the kino.

Mr. CHIPPERFIELD said he had never known any tincture of kino that had not gelatinized sooner or later, from the fact he supposed that it had been kept a somewhat unusually long time.

Mr. T. F. ABRAHAM stated that he had known tincture of kino for fifteen years, and he had never seen it gelatinize. The only difficulty he had had with it was that it wedged the stoppers of the bottles. To provide for this in their establishment there were two bottles, one a standard bottle which was placed on the ordinary shelves and with the other bottles, dusted and consequently shaken once a week, and another a bottle which was kept in the back part of the shop, and which was shaken perhaps not once in two months. The contents of both bottles were made at the same time from the same variety of kino, and both kept equally well. The gentleman whose paper they had listened to, before he suggested remedies should have been quite sure that what he used was really B.P. tincture of kino.

Mr. PRESTON stated that their tincture of kino had gelatinized once in seventeen years, and he believed that was caused by the stopper of the bottle having become a little loose.

Mr. ROBBINS had known tincture of kino for some time, and only once had he known it gelatinize.

Mr. SAVAGE gave his experience with the tincture, which was to the effect that at one establishment it had gelatinized, and at the other it had not, but had kept exceedingly well. The little that had gelatinized had been put carefully away in a cupboard; the one that had kept well had been exposed to the light and dusted every day.

Mr. ELLINOR said he had ordered kino from different houses, and the tincture made from some of them would gelatinize, and that made from others would not. That which tinged saliva was the best kind, and it never gelatinized as far as his experience went. He had, in a paper read at Bradford, recommended the substitution of a liquor containing glycerine in the place of the tincture, the object of which was, as far as possible, to avoid the use of spirit, but he had somewhat modified his opinion in consequence of Mr. Brady having then pointed out the extraordinary extent to which glycerine sometimes affected the characteristic property of astringents. He had observed in the *Journal* two recommendations for the use of glycerine in preparing the tincture, one preferring double the quantity of glycerine to be added to the other, but he thought they should be careful before altering a Pharmacopœia formula. If necessary at all to add glycerine, the smallest possible quantity to effect the object should be ascertained.

Dr. SYMES remarked that he had only met with tincture of kino that had gelatinized once, and he did not believe its gelatinization was so common as was generally supposed. Mr. Bamford had suggested a remedy in the keeping rather than in the preparation, but his own opinion was that the real remedy was in the preparation itself. The addition of a small quantity of glycerine appeared to be effectual, but it remained to be proved whether it affected prejudicially the astringency of the tincture.

Mr. LEE said he had known tincture of kino to keep for years in a fluid transparent condition when exposed to a strong light and frequently removed.

The PRESIDENT, in presenting the thanks of the Conference to Mr. Bamford for his paper, said it was his opinion that the remedy lay not so much in the management of the preparation as in the selection of the material of which it was composed.

The Conference then adjourned for luncheon, and upon resuming the first paper read was on—

ANHYDROUS AIR AS A THERAPEUTIC AGENT.

By G. A. KEYWORTH, F.C.S.

Some time since my attention was drawn to the great pain and inconvenience caused by tension in various morbid conditions. It occurred to me that air artificially dried and heated, and so made

an energetic absorbent of moisture, would give relief by causing shrinking of the parts. This I found to be the case. Frequent opportunities were presented of observing this effect upon a cancerous growth affecting the hand, with moist fetid surface. The jet was applied for an hour in the evening and caused cessation of pain for some eight hours, ensuring a good night's rest. After the application the surface presented a dried, shrivelled appearance. The loss of pain and stiffness was well marked and repeatedly verified. Anhydrous air as a mechanical anodyne may therefore prove a useful addition to the therapeutic armoury. The medical practitioner may see fit to apply it to gouty and edematous swellings, to inflamed surfaces, to indolent ulcers and intractable wounds with a view to promote healing by desiccation, and to various tumours and cancerous growths to relieve the pain and if possible check their increase. The apparatus I employed consisted of an eprouvette of glass, containing fragments of calcic chloride, through which large volumes of air were driven by means of a foot bellows of the Fletcher type. The exit end of the eprouvette was connected by india-rubber tubing with an iron tube three feet in length, with a diameter of half an inch, having a spirit lamp burning beneath the centre, and a piece of india-rubber tubing attached to the extremity for the purpose of applying the current. In this manner a stream of dried air heated to 100° F. could be maintained. A plug of cotton wool inserted within the entrance tube to the eprouvette acts as a filter when the jet is applied to unsound skin. The air might (if desirable) be impregnated with carbolic acid or other volatile substance by introducing a portion with the wool. Large volumes of air must be used and for a considerable time (sometimes several hours) in order to produce sensible effects. If the process should be found useful in medical practice, dispensing chemists will probably be called upon to supply the apparatus on hire. An economical form of it will be supplied by the usual dealers in pharmaceutical apparatus. If used in hospitals on a large scale, a small gas engine or hydraulic motor could be adjusted in order to drive large bellows or a fan wheel, the eprouvette being of increased dimensions and the spirit lamp replaced by a Bunsen flame. The addition of india-rubber gas bags and pressure boards or other methods of compression can be made if increased force to the jet is required. It may be remembered that warm dry air has long been observed to promote, and cold air to retard the healing of wounds. Anhydrous air, though not a caustic in the usual sense, shares with such substances a certain power of disintegration by its

affinity for moisture. The Michel process, introduced in Paris for removing tumours, consisted in the application of a paste of asbestos and sulphuric acid, the latter effecting destruction by absorbing moisture. Caustic potash, soda, and lime act in the same manner.

The effect of nitric acid is due partly to this and to its power of oxidation. Anhydrous air is, however, free from the dangers and objections which attach to the use of these energetic chemical agents.

Mr. Keyworth's paper was read by Mr. Benger.

There was no discussion on this paper, and a vote of thanks was awarded to the writer.

The next paper was on—

SAPONINE FROM THE BARK OF QUILLAIA SAPONARIA.

By H. COLLIER,

Teacher of Pharmacy at Guy's Hospital.

One of the subjects on the list of the Pharmaceutical Conference for investigation is Quillaia bark, its chemical composition, properties, and uses. This bark had been under my notice for some time before the issue of this list, but as my chief aim has been to determine more precisely the nature of the saponaceous principle which it contains, I have adopted the above title for my paper. I have been assisted in my endeavours by my friend, Mr. Scard, F.C.S., chemical assistant to Dr. Pavy, F.R.S., Guy's Hospital, to whose practical chemical knowledge I am indebted for the various analyses of saponine which I am able to lay before you. I have by no means exhausted the subject; in fact, what I have to say must not be regarded as a complete investigation of saponine. I have obtained some results which may be looked upon as so many steps of progress towards the goal, but nevertheless there remain many points which are still obscure.

A principle which makes a froth with water, similar to that formed by ordinary soap, is very widely diffused throughout the vegetable kingdom. Although generally known as saponine, from its original source, *Saponaria officinalis*, it has other names according to the plant from which it is obtained. All these saponaceous principles may be one and the same substance, modified perhaps by the impurities belonging to its extraction. Saponine has been the

object of numerous investigations, but most discordant results have been published respecting it by different experimenters. Thus Bussy, Henry, Plisson, and Overbeck, state it to be a white, non-crystalline, friable powder. Rochleder and Schwartz that it is colourless, and Quevenne that it is yellowish white. Again, according to Henry and Plisson it is inodorous, whilst Quevenne asserts that it has a peculiar aromatic odour, and Sharling that the aqueous solution has a repulsive odour. There is also a great difference in the formulæ assigned to saponine. According to Rochleder and Schwartz it is $C_{24}H_{40}O_{14}$, Overbeck $C_{42}H_{76}O_{30}$, and Rolley $C_{36}H_{56}O_{24}$. Before proceeding any further with the consideration of saponine, I think it will be well to say a few words respecting the source, character, and microscopic appearance of quillaia bark. The following description is from the "Treasury of Botany," part ii., 952:—"Quillaia saponaria, quillaia or cullay of the Chilians, is a tree from fifty to sixty feet high, with smooth, shining, short stalked, oval leaves, and usually terminal white flowers. Its bark, called quillaia, or soap bark, is rough or dark coloured externally, but consisting of numerous regular whitish or yellowish layers, and contains a large quantity of carbonate of lime and other mineral matters. It is rich in saponine, a vegetable soap principle, and on this account it is commonly used as a substitute for washing clothes, two ounces of the bark being sufficient to wash a dress. It is also said to remove all spots or stains, and to impart a remarkable lustre to wool, and it is used to wash the hair, for which purpose it is powdered between stones, then rubbed with the hands in water, making a foam like soap." The cortex quillaie which I have examined consisted of heavy flat or slightly curved pieces, varying in size from one to four feet in length, four to eight inches in breadth, and from a quarter to half an inch in thickness. The outer bark had been removed; there were, however, a few scattered pieces still remaining. Le Bœuf, who described the colour of the tincture he obtained as "d'une couleur orangée foncée," no doubt employed the bark without removing the remaining outside portions. Now, this is an important matter, as this outer bark contains a colouring principle which contaminates the saponine. In all my experiments I have operated upon a bark from which every portion of outside layer had been removed by planing and the use of the chisel. The tincture from this is of a pale yellow colour. It is not difficult to reduce the bark to coarse powder, if it is thoroughly dry, but if exposed to the air it absorbs moisture, and although it may easily be separated into layers, it is

not friable. It is rather an unpleasant substance to powder, the fine dust which arises causing a great amount of coughing and sneezing. Examined by the microscope, an opaque longitudinal section of the bark, with one inch object glass and oblique light, gives a general view of the woody tissue, upon and among which lie large crystals of what are undoubtedly oxalate of calcium, as they are unaffected by acetic acid, but are dissolved without any effervescence by hydrochloric. A longitudinal transparent section, part of which is stained with analine, shows principally the woody fibre with crystals lying about. In the coloured section some cellular tissue may be observed, and a few resinoid-looking bodies of a brown colour. I have one section here which is made in a part where the resinoid bodies are chiefly deposited. These are somewhat of an oval form, and I have every reason to believe they consist of saponine with impurities, giving them a brown colour. The bark ignites very readily, and during combustion gives off an aromatic odour somewhat resembling cedar wood. It yields 11.8 per cent. of ash, which consists chiefly of calcium carbonate; there is also a trace of iron.

Henry and Boutron-Charland were, I believe, the first who investigated quillaia bark and separated its saponaceous matter, which they described as an acrid principle. The method they adopted was to boil the aqueous extract with water, filter at the boiling heat, and the saponine which fell down on cooling and concentration was purified by solution in alcohol with aid of animal charcoal. I have prepared saponine by this method, but I was unable to obtain it pure; it would persistently remain brown after all treatment. The best process is that of Le Bœuf, which consists in boiling the bark with 84 per cent. alcohol, filtering at the boiling point, and upon cooling the saponine deposits. It is purified by washing with alcohol and ether. The principle of the above process is that saponine is more soluble in boiling rectified spirit than in cold, so that the excess deposits upon cooling, leaving above a saturated solution of saponine with colouring and other matters. This tincture upon evaporation yields 2.24 per cent. of solid residue. The first saponine I obtained by this process, after thorough washing with alcohol and ether, and drying over a water bath, was a white, friable, amorphous mass. There were some portions, however, which were not white but of a decided brown colour, and there appeared an oily stain upon the filter paper round the edge of the saponine. I found it to be very soluble in water, but ether, chloroform, benzol, carbon bisulphide appeared to have no effect in

dissolving it. A portion heated on platinum foil burnt very easily, and a white ash remained. This was insoluble in water, but dissolved at once with considerable effervescence in hydrochloric acid. A platinum wire dipped into this solution and held in the flame of a Bunsen burner produced a very well marked red colour. The acid solution neutralized with liq. ammoniæ gave on the addition of ammonium oxalate a white precipitate insoluble in acetic but dissolved by hydrochloric acid. An examination for other bodies gave negative results, so that the ash of saponine is composed entirely of calcium carbonate. Now Bolley's saponine contained 1 per cent. of ash, and one sample examined by Rochleder and Schwartz contained 4·3 per cent. These investigators are, I believe, the only persons who mention anything about an ash. This discovery of the fact that my saponine contained an ash was the result of a preliminary examination before submitting it to analysis; it was therefore necessary to obtain the amount before proceeding. The plan adopted was to ignite the saponine in a platinum dish; when the carbonaceous residue had become quite white it was cooled and moistened with solution of ammonium carbonate, evaporated to dryness, and again heated gently to expel excess of ammonia. The ash was thus weighed as carbonate: 49 of saponine yielded 0·0195 of ash carbonated as described, which gave 3·979 per cent. I could not regard this saponine as a pure substance. It had been most carefully prepared according to the process given by Le Bœuf, but the oily stain on the filter paper upon which the saponine had been dried, and the brownish tinge of some of it were so many indications of impurities. It was necessary for me, therefore, to endeavour to ascertain what was the nature of the impurities associated with saponine, and if possible to obtain a pure specimen in order to determine the formula of it.

I have worked upon three different lots of bark obtained at various periods, and the saponine prepared from all of them upon ignition left an ash consisting of calcium carbonate:—

Saponine from 1st bark	.	3·979	per cent. of ash.
„ 2nd „	.	3·904	„ „
„ 3rd „	.	3·843	„ „

The saponine prepared by boiling watery extract of bark with rectified spirit and deposition on cooling contained 4·37 per cent. of ash.

It is a question in what state the calcium exists in saponine; from its mode of extraction and after treatment it is hardly possible to

suppose that the calcium oxalate existing in the bark had been dissolved out with the saponine, and then appeared in the ash as carbonate. The fact that the saponine from different specimens of bark should yield such nearly equal amounts of ash is very strong evidence that saponine from quillaia bark is a calcium salt. I have endeavoured to obtain saponine free from calcium, but up to the present time I have failed to do so. It is stated by Rochleder and V. Payr that baryta water added to a strong watery solution of saponine precipitates saponine baryta, and that the white precipitate washed with baryta water, dissolved in water and then CO_2 passed through the solution, gives carbonate of baryta, which separates out, and after its removal the saponine may be precipitated by ether-alcohol. My saponine threw down a brown gelatinous precipitate with the baryta; which did not appear to dissolve in water, and CO_2 produced no effect in the filtrate from the digestion of the barium precipitate. I next tried precipitating a watery solution of saponine with neutral acetate of lead; the precipitate, which was a very gelatinous one, after washing, was dissolved in water, and a current of sulphuretted hydrogen passed through the solution for several hours. No precipitate was produced, but simply a black coloured liquid, which upon dilution with water formed a clear dark brown solution. Afterwards, to a similar solution of saponine in water, I added oxalic acid until the liquid was distinctly acid. It was then laid aside for several days, by which time the bottom of the beaker was covered with a white precipitate of calcium oxalate. The clear supernatant liquid was decanted and then neutralized with barium carbonate. It was impossible to filter quite bright, and so it was allowed to remain for a week. At the end of that time the clear upper liquid, which I hoped was nothing but saponine in solution, was drawn off and carefully evaporated to dryness; the result was a brown amorphous mass, which upon ignition left some amount of ash in which barium was present. I next turned my attention to an examination of the tincture from which the saponine had been deposited upon cooling. I considered that, as this tincture was only a solution of impure saponine, a knowledge of its composition might suggest the purification of the saponine. The tincture evaporated over a water bath left a soft reddish brown sticky extract. This was digested with washed ether for some days; by this treatment it lost much of its colour, but still retained its tenacious character. The ethereal solution was of a yellow colour, and when mixed with water became opaque, and after a short time a fatty matter appeared adhering to the sides of the tube. If

hydrochloric acid instead of water were employed, the fatty substance at once separated in the form of distinct lumps floating on the surface of the liquid. These were not dissolved on the addition of alcohol, and no change of colour was produced on the application of heat to the alcoholic mixture. Upon evaporating the ethereal solution, a soft oily substance remained, which imparted a permanent greasy stain to white paper; it was insoluble in water and alcohol, but readily dissolved by benzol. It was unaffected by alkalies or diluted acids. A similar oily matter may be obtained by adding tincture quillaia to water acidulated with hydrochloric acid. After standing for some time a yellowish precipitate separates which, collected upon a filter and well washed with water, dissolves entirely in ether, and this solution upon evaporation gives this oily residue. If washed ether be added to the tincture, this oily principle is also precipitated together with saponine. In this case the precipitate, after being well washed with rectified spirit and then dried over a water bath, is resolved into an oily fluid which soaks through the filter. The extract, after being treated with ether as above, was then digested with absolute alcohol for a week; at the end of this time the alcohol had acquired a reddish brown tint, and the extract had become a grey amorphous powder entirely devoid of stickiness. The alcoholic solution, acidified with hydrochloric acid and then heated, became of a cherry-red colour, which was changed to a dark olive-green by alkalies and restored again by the addition of acid. The residual extract treated with water dissolved entirely, and appeared to be only impure saponine. I had thus acquired two facts: that the impurities present in precipitated saponine were an oily matter soluble in ether, and a colouring principle soluble in alcohol. It would be necessary therefore only to treat with alcohol and ether in order to obtain pure saponine. But this had been the method of purification always adopted, and I have never obtained saponine without a marked oily stain upon the filter paper, and more or less brown colour. I tried digestion with alcohol and ether for several days, but the product was still impure. At last, after numerous experiments, I found that by boiling the saponine in rectified spirit, filtering at a boiling heat, allowing the precipitate to settle by cooling, and digesting this in absolute alcohol and ether, that a much whiter product was the result; it still, however, gave a red colour when heated with rectified spirit and hydrochloric acid. The saponine of which the analysis is given was purified as above, but the solution, deposition, and digestion were repeated a second time. It was a white amorphous substance, and the filter upon

which it had been dried presented no appearance of any oil stain, and dissolved in rectified spirit, and acidified with hydrochloric acid, upon heating no red colour was produced. I thus believed it to be a perfectly pure specimen of quillaia bark saponine. It contained 4.13 per cent. of ash, which is higher than that yielded by the other saponines prepared in a similar manner, but not subjected to so thorough a process of purification. Now the saponine obtained from the watery extract gave 4.37 per cent. of ash, which corresponds more closely to the amount obtained from purified saponine. I can say in explanation of this that the last sample being free from oily matter would yield a higher percentage of ash, and that the product from the watery extract probably yielded no oil, as this is not soluble in water, so that its ash approaches more closely that of pure saponine.

The absence of this oily impurity made a perceptible difference in the amount of carbon contained in the last sample of saponine compared with the first in which it was present. Now, this has an important bearing, for the amount of carbon contained in the first saponine I prepared and submitted to analysis was 49.31 per cent., and this corresponds closely to the amounts given in the published analyses: thus—

Rochleder and Schwartz	52.17 percent.
Overbeck	47.54 „
Rolley	49.54 „
Rochleder and V. Payr	52.97 „
Bussy	50.00 „

It is therefore very probable that these saponines containing such a high amount of carbon were not pure, and that the different results are owing to various degrees of purity of the sample examined.

The following is the result of the analysis of pure saponine:—

Calculated from formula $(C_9 H_{22} O_7)_{10} Ca O$.				Found.
C	43.63	.	.	43.51
H	8.88	.	.	8.88
O	45.23	.	.	45.30
Ca O	2.26	.	.	2.31
<hr/>				<hr/>
100.00				100.00

Deducting the Ca O, the percentage composition runs as follows:

C	44.53
H	9.09
O	46.38
<hr/>	
100.00	

Corresponding to the formula $C_9 H_{22} O_7$, which requires—

C	.	.	44.62
H	.	.	9.09
O	.	.	46.29
			<hr/>
			100.00

Considering the large number of atoms in combination with one of lime, it may be inferred that the lime is simply united with the saponine, and that it does not displace any hydrogen or compound radical; therefore we should be justified in calculating the formula for saponine in deducting the lime found, and re-calculating the percentage proportion. In fact, it may be assumed that saponine has a similar structure to that of arabine, which is said to be a calcium salt.

Another paper read by the same author was—

TINCTURE OF QUILLAIA AS AN EMULSIFYING AGENT.

BY HENRY COLLIER,

Teacher of Pharmacy at Guy's Hospital.

I now pass on to a consideration of the use of a tincture of the bark of *Quillaia saponaria* for the preparation of emulsions. The tincture which has been employed in the preparation of the various mixtures upon the table has been made according to the following formula, which is taken from Guy's Hospital Pharmacopœia:—

Quillaia Bark, in coarse powder . . .	4 oz.
Rectified Spirit of Wine . . .	1 pint.
Digest for three days and then strain.	

The bark before powdering is carefully freed from all remains of outside layer, and the tincture produced is of a pale yellow colour.

Into this bottle I have put some mercury and shaken it up with tincture of quillaia, the result is that the mercury has been reduced to a very fine state of division. It has very much the appearance of hyd. c. creta, and examined with a lens it is seen to be composed of distinct globules of mercury. So long as there is some tincture present this division of the metal remains; if it be dried, it at once runs together and appears in its ordinary liquid state. This is a remarkable power which tinct. quillaia possesses of destroying the cohesion between the globules of mercury, breaking them up and

preventing them from uniting together, and it is this property which renders it so valuable an emulsifying agent.

A true emulsion consists, as is well known, of a number of oily or resinous particles floating about in a watery liquid by means of some agent which prevents them from cohering. To be perfect the emulsion should have a milky appearance, and the suspended particles should not subside or rise too rapidly. In the British Pharmacopœia there is a preparation containing mercury in a very fine state of division, and which is in fact an emulsion containing mercury finely divided. The preparation I mean is the *Linimentum Hydrargyri*, which Squire says "should be a lead-coloured cream, but is curds and whey." By using tinct. quillaia a lead-coloured cream may be formed which does not turn to curds and whey. The preparation here contains the same proportion of active ingredients as is ordered in the Pharmacopœia; if left undisturbed for some time the ung. hydrargyri settles to the bottom, but a vigorous shaking blends it again perfectly. The following is the formula:—

Lin. Camph.	3j.
Tinct. Quillaia	5iij.
(Liq. Amm. Fort. 5ij, m 40 Aq. ad) . . .	5v.
Ung. Hydrarg.	3j.
M.	

Chloroform is made into an excellent emulsion by means of this tincture.

Chloroform	mx.
Tinct. Quillaia	3j.
Aq. Destil	ad 3j.
Misce.	

Although chloroform is such a heavy liquid, yet it remains suspended for some minutes after shaking. It finally settles as a creamy layer at the bottom of the bottle. A solution of saponine in water shaken with chloroform converts it into a thick creamy fluid; the water separates, but the chloroform permanently retains its creamy character.

Here is a mixture of castor oil made according to the following formula:—

Ol. Ricini	3ss.
Tinct. Quillaia	3ss.
Aq.	ad 3j.

The tincture is first put into the bottle, afterwards the oil, and shaken together, then the water is added and again shaken. The

emulsion thus formed resembles its prototype milk in appearance, and like it separates after the lapse of some time into a cream at the top, which mixes again upon agitation. Emulsions prepared in a similar manner of *oleum morrhue* and *oleum olivæ* are of as perfect a character.

Ext. Filicis Liquid	5j.
Tinct. Quillaia	5ss.
Aq. Destil	ad 3j.
Misce.	

This forms an excellent emulsion, and with the addition of syrup zingiberis, 3ss, constitutes the *mistura filicis maris* of Guy's Hospital,—

Copaibæ	3ss.
Tinct. Quillaia	5ss.
Aq. Destil	ad 3j.
Misce.	

The copaiba in this mixture is perfectly emulsified.
Here is an example of an essential oil.

Ol. Terebinth	℥xx.
Tinct. Quillaia	℥xx.
Aq. Destil	ad 3j.
Misce.	

This formula, with the addition of tinct. limonis, is the *mistura terebinthinæ* (Guy's).

I have found that resinous tinctures require more than their bulk of tinct. quillaia to prevent any separation of resin.

Tinct. Tolut.	℥10.
Tinct. Quillaia	3j.
Aq. Destil.	ad 3j.
Misce.	

The resin deposits after some time, but upon shaking it is easily diffused.

This mixture contains the soluble matter of 12 grains of guaiacum resin in every fluid ounce, so that it is about the same strength as *mist. guaiaci*, B.P. The following is the formula:—

Resin Guaiaci	gr. xij.
Tinct. Quillaia	3j.
Aq. Destil.	ad 3j.

Dissolve the guaiacum in the tincture, filter, and then mix with the water.

Resin of copaiba is largely used at Guy's Hospital, where it is considered a valuable diuretic. It does not appear to me to make so perfect a mixture with tinct. quillaia as the hospital formula with pulv. tragacanth co. The liquid is not thick enough to prevent the resin separating too rapidly. Here are mixtures of copaiba resin made after the following formulæ:—

Mist. Resinae Copaibæ (Guy's).

Resin of Copaiba	15 grains.
Rectified Spt. of Wine	20 minims.
Compound Powder of Tragacanth	15 grains.
Syrup of Ginger	1 fl. dr.
Distilled Water to	1 fl. oz.
Misce.	

The resin and spirit are put into an evaporating dish and blended together by heating over a water bath; then poured into a mortar containing the pulv. tragacanth co. previously made into a thick mucilage with a little of the water and well rubbed together, the syrup and the remainder of the water being gradually added.

Resinae Copaibæ	gr. xv.
Tinct. Quillaia	ʒj.
Aq. Destilat.	ad ʒj.

The resin is dissolved in the tincture, and the water gradually added with agitation.

Bals. Peru.	ʒxv.
Tinct. Quillaia	ʒj.
Aq. Destil.	ad ʒj.

This mixture is open to the same objection—the balsam subsides too rapidly. The above quantity of balsam with gr. xv. of pulv. tragacanth co. gives an excellent result.

I have now placed before you examples of emulsions of the various substances which are administered in that form, and I have no doubt that you will agree with me that tincture of quillaia is worthy of a place in pharmacy for the preparation of this class of medicines.

Mr. BENDER asked Mr. Collier if the taste of the tincture of quillaia was not sometimes objectionable.

Mr. REYNOLDS said he should like to extend the question put by Mr. Benger. The use of quillaia bark for these necessary purpose

of pharmacy would divide itself into two sections:—Its use for external and its use for internal purposes. The question of physiological action and questionable taste might be taken as parts of the same subject. He would like to inquire if there were any other instances than the use of the male fern oil emulsion for which Guy's Hospital would recommend the use of quillaia in an internal application, and if they were to understand that the half-dram dose containing 6 grains of bark was the maximum. Dr. Soullé had recommended an emulsion so as to bring carbolic acid into the form of a lotion, and had written very highly of its effects in the treatment of wounds after certain operations.

Mr. GREENISH observed that tincture of quillaia had been highly recommended by the Paris Pharmaceutical Society as an emulsifying agent. He had tried it in many instances, and had found it exceedingly useful. Dr. Vogl, of Vienna, had written most exhaustively on this bark; not only on its chemical composition, but its microscopical structure. There was also a valuable paper on its microscopical structure by Schlesinger in Wiesner's "Untersuchungen." He believed that tinct. quillaia would occupy a place in pharmacy.

Mr. A. H. MASON (Liverpool) remarked that the author spoke of quillaia bark in the natural state; his experience was that only the inner bark was offered for sale in this country; this was frequently stained, and he would like to ask if this was caused by exposure, or if any decomposition took place likely to deteriorate the bark. He would like to know, moreover, if the frothing power of quillaia bark was due to the presence of saponine, and if so whether saponine obtained from other sources had the same properties. He would also ask whether the watery or the alcoholic extract yielded the greater percentage of frothing power, and what the yield of extracts was.

Mr. LEE asked what strength of spirit was required to extract saponine from quillaia bark, and what temperature should be used.

Mr. UMNEY said he knew this bark was occasionally used medicinally, also that it was a most powerful drug applied externally. It entered into the composition of one well-known patent medicine, which had been before the public for years, and it was well known as a stimulant in certain skin diseases. Before it was recommended broadcast as an emulsifying body for all kinds of mixtures, they ought really to ascertain if it was harmless in its nature when administered internally.

Dr. SYMES referred to the use of quillaia bark in tooth powders and mouth washes as objectionable, on account of its nauseous acrid

taste, and asked if saponine in the purest form in which Mr. Collier had been able to obtain it still possessed this objectionable character.

Mr. FLETCHER asked if the saponifying property was peculiar to the lime compound.

Mr. HASSELBY asked how the author broke up the mercury, and said the process seemed so simple and effective that it might be used with advantage in sheep ointment.

Mr. COLLIER said as regarded the physiological action of quillaia bark, he could only refer to Husemann's "Pflanzenstoffe," in which saponin was mentioned as being poisonous to the lower animals; but the fact of its being adopted by the Paris Society of Pharmacy induced him to think there could not be any harm in the substance. He had made a considerable quantity of emulsions with it, but more particularly of cod liver oil. The tincture of quillaia added to cod liver oil, and flavoured with cinnamon, made really a very palatable mixture, and he knew one person, who having an objection to oil, even liked it in this way. He explained the process of breaking up mercury, and showed that it would do well to make sheep ointment.

The thanks of the Conference were given to Mr. Collier for his paper.

The next paper read was a—

NOTE ON ARICINE.

By JOHN ELIOT HOWARD, F.R.S.

Aricine was discovered by Pelletier and Corriol* in a cinchona bark coming from Arica to Bordeaux. M. Pelletier thought that he had obtained a characteristic green colour by nitric acid, but as no one has been able (as I think) to verify this observation, it is probable that the colour which he detected was owing to the presence of some impurity in the nitric acid which he employed. †

Subsequent researches were less successful, and much obscurity was permitted to involve the question, increased by the supposed identification of *cinchovatine*, discovered by M. Manzini, with this alkaloid.

Recently the whole subject has been elucidated by the researches of Dr. Hesse, who has sent over specimens of various alkaloids to

* Pelletier et Corriol, 1829, *Journ. de Pharmacie*, xv., 595.

† Pelletier, *Ann. de Chimie et de Phys.*, ii., 185.

the Museum of the Pharmaceutical Society, together with the barks from which they were derived.

My attention has been directed by one of the officials of the Society to the apparent perfect identity of the *aricine* of Dr. Hesse, with a specimen of the same alkaloid which I deposited in the Museum of the Pharmaceutical Society, in December, 1852, attached to a portion of the bark from which it was obtained. In company with some of the authorities of the Society, I have compared the two specimens, and am satisfied they are the same substance.*

The bark of Dr. Hesse and mine are exactly alike. It is the *jaune de Cuzco* of Delondre and Bouchardat (of which I have an example from the collection of these gentlemen), figured in plate xix., and described in pages 38 and 39 of their "Quinologie." M. Delondre † met with it in the forests of Sta Ana, in his excursions in 1847 with Dr. Weddell; and I have a botanical specimen gathered in the same year by the latter, which he calls "*Cinchona Pubescens*, Vahl., var. *Pelletierana*, Peru, Province de Carabaya, June 18, 1847." The bark was imported and sought to be introduced as calisaya, with which it was mixed in 1829. This gave rise to the researches of M. Pelletier. The *jaune de Cuzco* I have referred to is perfectly identical with the bark from which both Dr. Hesse and I have obtained aricine; and I doubt much its having been obtained in a crystallized form from any other. I have never said that I had extracted it from the bark of *C. succirubra*; though in the strange medley of substances which the old red bark contains, I indicated *aricine* (?) as possibly one of its contents. Probably this material was *paricine*, but it baffled my investigations.

M. A. C. Oudemans, junior, has been good enough to send me his "Recherches sur la Quinamine," which contains the analysis of 600 grams of the "mixed alkaloids" or quinetum from the bark of *C. succirubra* grown at Darjeeling. It is as follows:—

Cinchonine	.	.	.	.	.	37.0	per cent.
Quinine	.	.	.	.	.	6.1	"
Cinchonidine	.	.	.	.	.	22.9	"
Quinamine	.	.	.	.	.	4.5	"
Alcaloides amorphes.	.	.	.	.	.	21.1	"
Carbonate de sodium.	.	.	.	.	.	2.9	"
Eau	.	.	.	.	.	2.7	"

* The only perceptible difference is in the colour. Mine having been purposely crystallized in the first place from pure ether, to distinguish it from cinchonine, retains some of the peculiar yellow colouring matter.

† Delondre, 'Quinologie,' p. 39, p. 21.

Also in another experiment :—

Quinidine	0·5 per cent.
Conquinamine	0·3 „

I have been asked by the East Indian Government to give my opinion of the above as a medicament; and have objected to this mixture as containing so large a portion of alkaloid of uncertain description and of possibly injurious operation. Dr. Hesse* has found in the same compound "*Paricine* and two or three other amorphous basic substances." I myself found (in the product *first sent*) *copper* in so large a proportion as to coat the blade of a knife when introduced into a solution of the greenish powder. I have no doubt that the whole taken together would cure Indian fever, but should not like to subject myself to the treatment.

I have never put forward any claim to original discoveries as to *aricine*; but having pretty frequently met with the bark in past years, I satisfied myself by many experiments of the substantial accuracy of the first published researches of Pelletier; and consequently have asserted the same at the time that the existence of *aricine* was generally denied.

The first specimen of crystallized *aricine* in my museum is dated October, 1849, and I have specimens of compounds of this alkaloid in 1853-'54 and '57. I have also some results from researches on the very peculiar colouring matter.

I am pleased that this subject is now again occupying the attention of chemists, and hope that the physiological effects of this singular substance, as well as those of *paricine*, will be investigated by some competent member of the medical profession.

This research possesses an interest beyond that which would at first appear, because it has relation to the classification of the different species of the genus *Cinchona*. It is obvious that the large production of quinine by the *C. Calisaya*; of cinchonine by the *C. Peruviana* and its congeners; of quinidine by the *C. Pitayensis*; of cinchonidine by varieties of *C. officinalis* and *C. lancifolia*; and of *aricine* by *C. Pelletierana*, point to real specific differences; and there is more even than this fact to be learned in the above connection.

In "Observations on the Present State of our Knowledge of the Genus *Cinchona*," † published in the Report of the Botanical Congress of 1866, under the head "*Jaen and Cusco barks*," I have noticed that the *C. Pelletierana* is the true *Quina amarilla*, or yellow

* *Pharm. Journ.*, April, 1879, p. 839.

† Report, p. 208.

bark, and that "around this are gathered other species of cinchona, which, viewed in this light, constitute a very exceptional and anomalous group of plants;* which most certainly belong to the genus *Cinchona*, but in which the typical cinchonaceous elements are superseded by those corresponding to, and perhaps identical with, the products of other families of plants. I have shown under the heads *C. lutea* (*quod vide*) and *C. decurrentifolia*, in my illustrations of the "Nueva Quinologia," how botanical and microscopical researches illustrate and confirm each other; and how microscopical examination comes in to aid the diagnosis of the barks; all tending to show the *Ladenbergia-like* character which pervades them: and under the *C. lutea* it appears that Pavon's careful observation of the living plant brings out indirectly the same fact. He says that "a milky juice flows out when the trees are cut down or amputated;" that is to say, the milk cells are abundant and full of their peculiar product, in which respect the tree symbolizes specially with the kindred genus.

I refer to the "Report" itself for further observations on these yellow barks, and to my remarks† under *C. lutea* for the *yellow colour*. In conclusion, I would briefly add that, the *red barks* are equally a *group of plants* of which the *C. succirubra* may be looked upon as the centre. (See my account of specimens of *C. succirubra* in my "Nueva Quinologia," pp. 4, 5.) The *red bark* is only beginning to be fully investigated as to its alkaloids, and *even less so as to its other constituents*, as I have partly remarked in the work alluded to; but this much may be said with certainty, that the physiological effects must be considerably different from those of other barks. The Spanish physicians had an opinion about it, to which I cannot at the moment refer. I understand that a fluid extract of *C. succirubra* has recently obtained some celebrity, but have not yet had an opportunity of examining it. It is probable that its medicinal effects may vary from those of a tincture of *pale bark*, and still more widely from a tincture of *yellow* (*cordifolia*) or of *Calisaya bark*.

A vote of thanks to Mr. Howard was passed.

* The group comprehends *C. Pelletierana*, *C. cordifolia*, *C. lutea*, *C. decurrentifolia*, *C. villosa*, *C. ovata*, *C. obovata*, *C. microphylla*.

† *Vide* "Nueva Quin.," sub. *C. lutea*.

The author of the next paper not being present, an abstract of it was given by Mr. W. A. H. Naylor. The full text is as follows:—

THE CHEMISTRY OF CHAULMOOGRA OIL.

BY JOHN MOSS, F.I.C., F.C.S. LOND. ET BER.

A body possessing well marked physical characters, and capable of producing effects interesting alike to the physiologist and the therapist is sure to excite that spirit of inquisitiveness which is the moving force in all scientific inquiry. The physiologist and the therapist both want to know what is the proximate cause of the phenomena noted by them, and the chemist busies himself to find it out, separating by his art the inert and diluting material. The members of this Conference sympathise most with the latter, and if each could be persuaded to tell the conclusion to which a scientific use of the imagination had led him in speculating as to the nature of the said proximate cause, nine times out of ten he would suggest an alkaloid. There is about an alkaloid something so definite, so tangible and real; it is so compact an expression of ideas and properties, is so representative and genuine, that to discover it is a desirable thing, and its presence is easily assumed where strongly marked properties exist. The thought is begot by a powerful desire, and is itself strong—so strong that all others relating to the same body are for the time subservient to it. That chaulmoogra is a most powerful drug need not be insisted on here, seeing that the widely known favourable testimony of highly qualified observers in Europe and Hindoostan is concurrent with the position it occupies in the “Pharmacopœia of India,” and the almost veneration with which it is regarded by the native Hindoos. That an alkaloid should be the first thing looked for when an examination of the oil was resolved upon was a matter of course; had one been discovered, further investigation had probably been stayed. As a guide and a warning to others who may be encouraged by this failure, the method adopted in searching for the possible alkaloid is here given.

§ 1. EXAMINATION FOR ALKALOID.

(*α*) *Volatile*.—One pound of chaulmoogra was placed in a retort with twice its weight of water, and boiled. The collected distillate (4 ozs.) was perfectly clear, possessed the odour of the oil in a marked degree, and was neutral to test paper. With acetate of lead a precipitate was thrown down, as also with chloride of barium

when made perfectly neutral with potash. With the usual alkaloidal reagents no change was produced in the liquid, which was accordingly precipitated with lead acetate, the precipitate collected, decomposed with hydrochloric acid, and agitated with ether. Evaporation of the ethereal solution gave a fatty body, which was not further examined. The contents of the retort were now made alkaline with solution of soda, and the distillation was continued; this time the distillate gave no indication with any of the reagents used in the first instance, and was returned to the retort, along with sufficient sulphuric acid to be in excess. Twelve ounces of distillate were collected, and on the surface of it were floating aggregations of white, silky needles. The liquid was negative to reagents. The white needles were collected and found to weigh 2 grains. They possessed all the characters of cocinic acid, treated of afterwards.

(b) *Non-Volatile*.—A pound of the oil was agitated with successive portions of warm water acidulated with hydrochloric acid, in a Winchester quart bottle. After each agitation the bottle was inverted and allowed to stand till cool, when the oil formed a solid cake, from which the liquid could be easily run away below. The united liquids were reduced in bulk over a water bath, and tested with the usual alkaloidal reagents, namely, phosphomolybdic acid, iodo-hydrargyrate of potassium, iodine in iodide of potassium, iodide of bismuth and potassium, and iodide of cadmium, each one of which produced a precipitate. The whole was now rendered alkaline by soda, filtered, and half the filtrate agitated with chloroform. The chloroform on evaporation to dryness gave a residue which was treated with very dilute sulphuric acid, and the acid solution was shaken with chloroform after addition of sufficient ammonia to make it alkaline. The chloroform solution was separated and divided, one portion being shaken with water containing sulphuric acid, and the other with hydrochloric acid. Very slightly coloured residues were obtained on allowing each of these solutions to evaporate spontaneously. The residues when microscopically examined exhibited after a time well defined isolated needles and prisms, few in number and widely scattered; the quantity of these crystals was so very minute that any attempt at a chemical examination was entirely precluded, even if its minuteness as compared with the original bulk of oil had not robbed them of all significance. The residues when dissolved in weak acid—they would not dissolve in water—gave a precipitate with ammonia, which was found to agree in character with the ammonia salt of a fatty acid.

A like result attended the treatment of the second half of the filtrate with ether in place of chloroform. A further search for an alkaloid was made on the liquor produced, when one pound of oil was saponified. The treatment was precisely as the foregoing after addition of soda. The precipitate formed by soda in the first instance, and already existing in the second, and which consisted of the hydrate and phosphate of calcium, vegetable tissue, etc., was digested in chloroform and further examined for alkaloid. Each attempt was rewarded with non-success.

Satisfied either that chaulmoogra contained no alkaloid at all, or that if it did the quantity was so very small that no share in the properties of the drug could be reasonably claimed for it, a fuller and more systematic examination than was at first contemplated seemed to be desirable. Such examination was accordingly instituted, and it grew in interest as fact after fact was slowly and laboriously laid bare. And here I would say that I know of no research drawing more frequently and more largely upon the patience and the resources both of mind and fingers of the chemist than the unravelling of the constitution of a complex fatty body, and my thanks are due and are cheerfully given to my friend and assistant, Mr. W. A. H. Naylor, for his unwearied and painstaking attention to my wishes, and for his suggestive interest in the work, which was rendered more difficult by the exigencies of a busy laboratory, where numerous and varied operations were proceeding at the same time.

§ 2. GENERAL EXAMINATION.

To make this account more complete it is necessary that I should refer to a previous paper published in the *Chemist and Druggist* for December, 1878.

To a general description there given of chaulmoogra were joined certain remarks having industrial and pharmaceutical interest; and besides these, the paper furnished results obtained in a preliminary examination undertaken as stated, "with a view to obtain indications of the direction in which more particular investigation would lead to the most interesting and valuable results." A summary of these results will not be out of place here, inasmuch as it will assist in avoiding subsequent explanations.

(a) *Summary of Results Previously Obtained.*—Chaulmoogra oil has a decided acid reaction. The melting point is 42°C. , and at that temperature the specific gravity is $\cdot 930$. It froths freely when

agitated with warm water, and after standing separates over the surface of a milky emulsion. At the ordinary temperature, alcohol (·807) dissolves a considerable proportion, including those constituents of higher melting point and acid reaction possessing the characteristic odour and acrid taste of the oil, and giving Dymock's reaction (a rich olive-green colour with oil of vitriol) very readily. The portion not dissolved by cold alcohol exhibits a pale green colour with oil of vitriol, and is completely dissolved by repeated treatment with warm alcohol of the same strength. Ether (·720), chloroform, carbon disulphide, and benzine (·827) completely dissolve the oil, except (and the exception equally applies to alcohol) a minute proportion of flocculent dust consisting of oxalate and phosphate of calcium, sodium and potassium salts, vegetable tissue, and albuminoid bodies. The albuminoid bodies are present in sufficient quantity to form a milky emulsion with a small proportion of whatever quantity of oil is agitated with water.

By saponification with potash and decomposition of the resulting soap by hydrochloric acid, 81·11 per cent. of fatty acids are obtained, which after exposure assume a white bloom similar to that observed on the surface of Japan wax. The fatty acids give a fine green colour on the application of Dymock's test.

(b) The results which follow have been obtained since the publication of the paper above referred to, and though they still leave the chemical history of chaulmoogra oil in a somewhat incomplete state, they form an interesting addition to our knowledge of this important drug.

The melting point of the fatty acids just as obtained from the oil in a mixed condition is 44° C. Numerous preliminary trials were made of processes for separating and identifying them which promised well on paper and were serviceable as illustrating the behaviour of the acids and their compounds under certain treatment, and which in addition to this, did indeed suggest the probable presence of acids afterwards found, but however interesting and instructive to the experimenter, the details would prove but tedious to others, and accordingly I shall confine myself to describing the processes finally adopted, by which the proximate principles to be described were actually separated.

(c) *Free Fatty Acids in the Oil.*—The strong acidity of the oil and its solutions indicates the presence of one or more free acids; to separate and identify these was the first part of the problem to be attacked. Half a fluid ounce of the oil was shaken with three fluid ounces of a saturated aqueous solution of hydrate of barium at 100° F. The

watery liquid was removed and the oil washed with successive quantities of water at the same temperature as the solution originally used, until the washings came away neutral.

The united liquids were filtered, acidified with hydrochloric acid, and boiled. There was no separation. The oil therefore does not contain any compound of a fatty acid, and does not form with hydrate of barium any such compound, which is soluble in water or baryta water.

(d) Oil treated as above will contain the fatty bodies originally present in it, and barium compounds of the free acids originally present. From this oil cold alcohol (.807) and ether (.735), used successively, dissolve away the former, leaving all the barium compounds; boiling alcohol dissolves a very few grains of the residue. The residue, consisting of barium compounds, was then fused by admixture with boiling water, hydrochloric acid added, and the fatty acids collected on a filter and washed with hot water until the washings were neutral and free from barium chloride. After this the fatty acids were kept melted on a water bath till dry, when they were treated with alcohol and the solution set aside. In a little while crystals appeared which when first tried melted at 55°C . By repeated crystallization from warm alcohol these were finally obtained of a pure white colour and having a constant melting point of 62°C . With the aid of a microscope and selenite plate this crystalline body was recognised as palmitic acid. The crystalline form and the arrangement of the crystals corresponded exactly with a beautifully executed photograph of palmitic acid forming one of a number in a pamphlet* published by Price's Patent Candle Company, and besides it corresponded in all characters to a specimen of chemically pure palmitic acid, for which as well as the pamphlet I am indebted to the kindness of the company.

On the first treatment with alcohol of the fatty acids separated as above, a portion remained undissolved, which was subsequently found to go into solution when more alcohol was used, especially when warmed. This portion consisted of palmitic acid solely.

(e) The alcoholic solution first obtained, from which crystals of impure palmitic acid separated as the alcohol slowly passed away into the air, yielded on evaporation to dryness a fatty acid, which when purified by repeated treatment with small quantities of cold alcohol had a fixed melting point of 29°C . This body is more fully described later on (h).

* "Examen der Acides Gras par la lumière olarisée."

(f) Turning now to the fatty acids obtained by decomposing the soap of chaulmoogra, 31.7 grams of the mixed acids were dissolved in just sufficient alcohol for the purpose, and the solution was saturated by adding solution of ammonia (.959). This converted all the acids present into ammonia salts. Acid palmitate of ammonia is not freely soluble in spirit and separated out at once; the acid from this precipitate was prepared in the free state and identified. It was not pure, but contained another acid not recognised at the time; which will be found freely described in *h*; this acid is also mentioned in *e*. The spirituous solution of the ammonium salts was now treated with chloride of ammonium and acetate of magnesium. These failed to produce any visible change in the solution, thus indicating the absence of more than traces of palmitic acid. On the further addition of an aqueous solution of chloride of barium, a precipitate fell of a viscous character. This was collected and digested with cold alcohol, which dissolved a small portion, leaving a precipitate which was decomposed, washed, dried, dissolved in alcohol, and exposed to cold. The solution separated from the crystalline deposit of palmitic acid was now treated with lead acetate in presence of ammonia, and warmed, and the precipitate resulting from this treatment, was likewise set aside. The filtrate was kept warm until all the alcohol was expelled, and the liquid containing the lead salt thrown out of solution by the expulsion of the alcohol was treated with ether, by which it was completely cleared. Hydrochloric acid was now added, the chloride of lead produced removed by a filter, and the ethereal solution of fatty acid allowed to evaporate spontaneously. A crystalline substance separated in rosettes, which when subsequently crystallized from alcohol was quite colourless, but turned yellow in a few hours. It melted at 33° C. This is the melting point of hypogæic acid, which moreover possesses the characteristic of turning yellow a few hours after it is prepared. Hypogæate of lead is readily dissolved by ether; it also dissolves in warm alcohol, but the greater proportion separates out upon cooling. It is not precipitated by magnesium acetate in presence of alcohol. The barium compound also dissolves in hot alcohol, but falls out of solution on cooling. The compounds of the acid under consideration possessed all these characters, and its identity with hypogæic acid was established by a combustion. 0.181 gram was burned with chromate of lead and yielded .1369 gram of carbon, and .0217 gram of hydrogen; side by side I give the numbers obtained, calculated into percentages, with those required by the formula for hypogæic acid, $C_{16}H_{30}O_2$.

Numbers Obtained.					Theoretical Numbers.				
Carbon	75.63.	.	.	.	.	.	.	75.59	
Hydrogen,	11.99.	.	.	.	.	.	.	11.81	

(g) The precipitate produced by acetate of lead and not dissolved by warm alcohol was freed from adhering liquor by pressure between folds of bibulous paper, and then digested in ether; hypogæate of lead was dissolved away. The insoluble portion was decomposed by hydrochloric acid, and the free fatty acid crystallized from ether. It melted at 38.5°C ., and crystallized in a form very closely resembling that assumed by palmitic acid, but when crystallized under the same conditions it is not so delicate as the latter. A further small quantity of this acid, as also of hypogæic acid, was obtained from the cold alcohol washings of the viscous barium precipitate. To examine it more particularly 660 grains of the mixed fatty acids were used for preparing some by a method slightly modified from the above. The acids were dissolved in alcohol and the solution was treated with ammonia and magnesium acetate. The precipitate, which will be considered later, was collected on a filter. Lead acetate was added to the filtrate, and after two days standing the mixture was filtered. The precipitated lead salt was washed with cold alcohol, dried, and digested in ether. The insoluble portion was again dried, fused on the surface of warm water, and decomposed by hydrochloric acid. The liberated fatty acid being removed by agitation with ether, was freed from the solvent and then dried over oil of vitriol. It weighed 18 grains, and by observation of the melting point was found to be still impure, owing to the presence of palmitic acid. This was removed by fractionation from alcohol, and the final pure product, a white crystalline mass, weighed when perfectly dry 10 grains. The melting point was constant at 385°C .

0.171 gram burned with chromate of lead gave .184 gram of water and .446 gram of carbonic acid, corresponding to .0204 gram of hydrogen and .1216 gram of carbon, or in 100 parts—

	Numbers Obtained.					Calculated from $\text{C}_{11}\text{H}_{22}\text{O}_2$.				
Carbon	71.11	.	.	.	.	70.97				
Hydrogen	11.92	.	.	.	.	11.82				

By the side of these numbers I have placed others with which they closely agree, calculated from the formula $\text{C}_{11}\text{H}_{22}\text{O}_2$, an acid not usually mentioned in the text-books, but which I find very fully described under the name of cocinic acid in a paper by M. Saint Evre—*Recherches sur les Acides Gras du Beurre de Coco*.^{*} He says,

^{*} *Annales de Chimie et de Physique*, troisième série, 1847, xx., 91.

“ Il cristallise par le refroidissement de sa dissolution alcoolique en aiguilles incolores groupées en étoiles autour d'un centre commun. Il fond à la température de $34\cdot70$, et se dissout aisément dans l'éther et l'alcool à 36 degrés. Il est depourvu de toute espèce d'odeur, et lors qu'il a été maintenu en fusion pendant longtemps, puis soumis à l'action du vide, il se présente sous la forme d'un masse incolore, dure et cassante. Il se volatilise, mais seulement dans un courant de gaz.” This description applies perfectly to the acid separated from chaulmoogra, with the single exception of the melting point. According to Dumas' theory, a body having carbon atoms in the series $C_nH_{2n}O_2$, should melt at $36\cdot5^\circ C$. Saint Evre's observation was as much below this point as that here recorded is above; and looking to the source whence his acid was obtained, it was quite as likely to contain a minute trace of oleic acid as the cocinic acid from chaulmoogra is likely to have still held a trace of palmitic. Referring more particularly to the volatility of coccini acid in a current of gas, it will be seen in the section which describes the examination for alkaloid, that silky needles possessing all the properties of this acid were found in the distillate from chaulmoogra and water with sulphuric acid.

The position of cocinic acid is between rutic or capric acid and lauric acid in the series $C_nH_{2n}O_2$.

(h) The magnesium acetate precipitate obtained in the last process was decomposed by hot dilute hydrochloric acid, and the liberated fatty acids were washed till free from chlorides. Palmitic acid was separated from the mixture at first by dissolving in warm alcohol and cooling, but this method was altogether inadequate to its complete removal, and a method of fractional precipitation was adopted; first, by the cautious addition of a concentrated aqueous solution of magnesium acetate to the simple alcoholic solution of the acid, and afterwards by similarly treating the solution when it had been made neutral by ammonia.

After the separation of the fractions, the alcoholic strength and solvent power of the solution was reduced by the addition of water, and on standing a small quantity of magnesium salt separated out. That the last traces of palmitic acid were thus removed was shown by the following treatment of the filtrate. This was decomposed by hydrochloric acid, the fatty acid removed, washed, and dissolved in alcohol. To the solution water was added till feebly opalescent, and then the mixture was exposed to a temperature of $6^\circ C$. for some time without any further separation. The weak alcoholic solution was gently evaporated and allowed to crystallize. After repeated

crystallizations a body was obtained of a feeble yellow tinge, which, under the microscope, shot out as it cooled into crystalline plates with a more or less deep thalloid fringe, polarizing at the margins only. The melting point was 29.5°C . Fractionated from alcohol, the fractions were homogeneous, exhibiting precisely the same crystalline form and melting at exactly the same point.

0.348 of the acid burned with chromate of lead gave 0.3465 gram of water, and 0.955 gram of carbonic acid gas equivalent to 0.0385 gram of hydrogen, and 0.2604 of carbon; or, 11.06 per cent. of the former, and 74.84 of the latter element.

In a second combustion 0.381 gram gave 0.382 gram of water and 1.048 of carbonic acid gas; equivalent to 11.13 per cent. of hydrogen, and 75.01 of carbon.

In a third combustion 11.2 per cent. of hydrogen was obtained. The results, placed side by side, show as follows:—

	No. 1.	No. 2.	No. 3.
Carbon . . .	74.84 . .	75.01 . .	
Hydrogen . . .	11.03 . .	11.13 . .	11.2

The numbers correspond to a number of the little known series, $\text{C}_n\text{H}_{2n-4}\text{O}_2$, and the probable formula is $\text{C}_{14}\text{H}_{24}\text{O}_2$, which by calculation gives—

Carbon, 75; Hydrogen, 10.7.

Though additional data will be required to determine the formula, I think it is certain that this body has not been previously examined and described; and accordingly, having reference to its source, I propose to name it *Gynocardic Acid*, and trust shortly to be able to announce the correct formula.

This is the acid referred to in *e* and *f*, and, as already stated, has a pale yellow colour and a well-marked crystalline form. Gynocardate of ammonium is soluble in water. The magnesium salt is insoluble in water, but dissolves in alcohol (807) and falls out of solution on diluting. The lead and barium salts are insoluble in water, ether, and cold alcohol.

§ 3. DYMOCK'S TEST.

Reference has been made in this paper to Dymock's test for chaunmoogra oil. Fuller reference will be found in the paper from which I have already quoted (*vide* p. 251), where the opinion was expressed that the reaction on which it is based was characteristic of the oil, and taken in connection with physical characters might be used as an indicator of genuineness. In the course of investigation

I have been compelled to modify this opinion, and take the present opportunity of qualifying it. As progress was made in the work of separating the proximate parts of chaulmoogra, each was subjected to the test with the result, at first, that the colour was invariably obtained. One of the first separated quantities of palmitic acid gave the colour in so marked a degree that certain natural substances known to contain palmitic acid as well as the pure acid itself were submitted to the test. It was thus ascertained that pure palmitic acid does not present the reaction, nor do any of the bodies experimented with, including Japan wax and butter, except palm oil. This gives a splendid green colour with sulphuric acid when applied as Dymock directs, a colour of the same character as that afforded by chaulmoogra. The green coloration is therefore not peculiar to the oil, as was supposed by Dymock, but is a property which equally belongs to palm oil. As the working processes improved with additional knowledge of the material, the constituents of chaulmoogra which gave the green colour were reduced and narrowed by purification, till only the last, *gynocardic acid*, remained. It still remains. It has not been found possible by any means to deprive *gynocardic acid* of this colour-giving power. A quantity of it has been dissolved in alcohol and crystallized from it in successive small portions—each fraction has given the colour with equal intensity. It has been digested with animal charcoal, and after such treatment the colour has been verdant as before; it is inherent and a characteristic. *Gynocardic acid* also produces the acrid burning taste which is noticed when chaulmoogra is swallowed, and altogether appears to be a constituent of such importance as to deserve further attention, not only from a chemical point of view, but also in regard to its medicinal activity.

§ 4. CONSTITUENTS SEPARATED AND RECOGNISED.

Chaulmoogra oil, then, so far as it is at present known, contains:—

Gynocardic Acid	.	.	.	.	.	.	11.7
Palmitic Acid	.	.	.	.	.	.	63.0
Hypogæic Acid.	.	.	.	.	.	.	4.
Cocinic Acid	.	.	.	.	.	.	2.3

in combination with glyceryl as fats, and the two former in the free state as well. No attempt was made to determine accurately the proportion of each acid present, as the loss in purifying was necessarily considerable, but the figures against each represent fairly well the quantity of acid in 100 parts of oil.

The PRESIDENT said this paper was a very exhaustive and admirable one, and the members of the Conference owed their thanks not only to the writer, but to Mr. Naylor, whose clear and comprehensive condensation of its contents had placed the subject so lucidly before the Conference.

Mr. A. H. MASON said as some of the members present might be unacquainted with this oil, it would be well if information were given as to its origin and supposed properties.

Mr. NAYLOR said the oil was obtained from a plant known as the *Gynocardia odorata*, and had been used very successfully in cutaneous diseases. It was an oil much used in India, and had been sold in the bazaars there for a great number of years. It had also been used with considerable success in this country in cases of phthisis, but had not been previously studied chemically, except by Dr. Dymock.

Mr. WILLMOTT quoted a case in which it was found that the medical properties of chaulmoogra oil were not so great as those of gurjun oil.

Mr. BAXTER spoke of chaulmoogra oil as a cure for itch and mange in dogs.

Mr. GREENISH said that the green coloration produced by a drop of sulphuric acid brought into contact with the chaulmoogra oil, being considered by Dymock a test of the genuine oil, he would like to know from Mr. Naylor if he had tried it on oil extracted, for instance, by benzine, to ascertain if the coloration proceeded from the oil or from some organic matter which may have been pressed out into the oil.

Mr. NAYLOR, in reply, said chaulmoogra oil had been used for a variety of purposes, but it was never intended to be a panacea, and in some cases it had not been so successful as others. He had known it to be largely used in mange in dogs, and he had not heard of a case in which it had failed. With reference to the green colour produced with sulphuric acid, whatever solvent might be used, providing gynocardic acid was present, the fat from the solution would give a green colour. That test had been applied to the oil which had been extracted with benzol and oil obtained by pressure.

The next paper, which was read by Professor Attfield, the author not being present, was entitled—

THE CAPACITY OF DIFFERENT ORGANS TO ABSORB AND RETAIN ARSENIC IN CASES OF CHRONIC POISONING.

BY N. P. HAMBERG, M.D.,

Honorary Member of the Pharmaceutical Society of Great Britain.

It is almost unanimously admitted by toxicologists that arsenic is diffused throughout the whole body, but deposited in the largest quantities in the liver and kidneys.

Another opinion was, however, promulgated at a meeting held by the members of the German Chemical Society at Berlin, in 1875, when the following results of experiments made by Scolosuboff, and published under the title, "Ueber die Localisation des Arseniks von Scolosuboff,"* were mentioned:—

"In chronic, as well as in acute poisoning, arsenic chiefly accumulates in the brain, spinal marrow, and nerves. The liver contains a less, and the muscles a still less relative amount. In a dog, which had progressively absorbed during thirty-four days 0.005 to 0.150 grams of arsenious acid daily, the following quantities of arsenic were found in 100 grams of the fresh organs:—

100 grams of muscles,	0.00015 gram Arsenious Acid.
100 " liver,	0.00271 gram Arsenious Acid.
100 " brain,	0.00885 gram Arsenious Acid.
100 " spinal marrow,	0.00932 gram Arsenious Acid.

"The localization of arsenic in the brain, which, even in cases of acute poisoning† is very evident, is, with regard to legal chemistry, of considerable importance."

The results of Scolosuboff's observations induced me to make further experiments, in the execution of which Professor C. Lindqvist, of the Royal Veterinary Institute of Stockholm, most willingly lent me his assistance.

A clyster, containing 1 gram of arsenious acid dissolved in a solution of carbonate of soda, was administered on the 21st of February, 1878, to a full grown dog, weighing 9775 grams. This, however, produced so much irritation that it was voided after an interval of about fifteen minutes, and the dog on this and the following day appeared to be in perfect health.

* *Pharmaceutische Centralhalle für Deutschland*, Nov. 11, 1875, p. 383.

† Scolosuboff's investigations give no reasons for this supposal.

From the 22nd of February to the 12th of March of the same year, 15 to 29 drops of a solution containing 1 gram arsenious acid, 2 grams carbonate of sodium, and 20 cubic centimetres of water, were daily administered to the dog, with the exception of on one or two days, when he evinced loathing to his food and great emaciation.

After the 12th of March, 10 to 20 drops of an arsenical solution of the same strength as the first, of the 21st of February, were administered daily. During the last weeks he had taken very little food and become extremely weak; he had by that time taken 1.2 gram of arsenious acid. On the day following death, the 21st of March, a *post mortem* examination was made, when the most noteworthy appearances were as follows:—The body was very emaciated and weighed only 5525 grams. The veins of the organs of the abdomen were in a high state of congestion. The serous membranes of the stomach and of the intestines were uniformly red in colour. The stomach, which contained no food, had in it a small quantity of mucus mixed with blood; the epithelium of the mucous membrane was on some parts removed and two superficial ulcers were discovered, the larger being 3 centimetres in length with a breadth of 1 centimetre. The intestines were likewise void of food, their sole contents being blood-streaked mucus and altered blood; the mucous membrane was much injected, especially in the lesser intestines. The membranes of the intestines were thickened. The liver was of normal size but charged with blood, dark in colour and covered with small bright spots, an evidence of fatty degeneration having commenced. The bladder was distended with clear urine. The heart, as well as the lungs, together with the trachea and the bronchial tubes, the spleen, the kidneys, and the spinal marrow were of normal character. The brain was of normal appearance with the exception of the blood vessels being highly congested at its base. The blood was dark coloured and congealed.

The following portions of the body were placed in separate vessels for analysis:—1. Brain. 2. Spinal Marrow. 3. Heart and Lungs, with some of the blood. 4. Stomach and Intestines. 5. Liver. 6. Kidneys. 7. Muscles. 8. Bones. 9. Bladder with urine.

As there was difficulty in analysing all these objects at the same time, such as could not be immediately employed were impregnated with chlorate of potash and hydrochloric acid, in order to prevent a gaseous escape of arsenic. Analysis was conducted in the following manner:—The object was treated with chlorate of potash and

hydrochloric acid, the filtrate impregnated with sulphuretted hydrogen, the precipitate fused with nitrate and carbonate of soda, the fused mass dissolved in water, the solution oversaturated with nitric acid, a large quantity of ammonia added, and the arsenic precipitated with chlormagnesium mixture as arseniate of magnesium and ammonium, which was collected on a ready weighed filter and dried at $+102^{\circ}$ – 105° C.

OBSERVATIONS MADE DURING TIME OF EXPERIMENT.

The 26th of February.—10·24 grams of fæces and 54 cubic centimetres of urine were taken for analysis. The dark brown fæces, as also the urine, showed, with nitric acid, a very large quantity of colouring matter of bile, but only slight traces of arsenic were observable.

The 28th of February.—65 cubic centimetres of urine and 31·02 grams of fæces were subjected to analysis with the following results:—

(a) 65 cubic centimetres of urine left 0·00025 gram arseniate;* thus 1 litre 0·0031, which would correspond to 0·002 gram arsenious acid.

(b) 31·92 grams of fæces produced 0·0017 gram arseniate, consequently 1000 grams, 0·0548 gram arseniate equal 10·0286 grams arsenious acid.

OBSERVATIONS MADE ON PORTIONS OF THE BODY.

1. *Urine.*—The bladder contained 25 cubic centimetres of urine, which was of a reddish colour and strongly impregnated with albumen. By analysing 0·001 gram of arseniate was obtained. One litre would thus yield 0·04 gram, corresponding to 0·02084 gram arsenious acid.

2. *Spinal Marrow.*—This weighed only 17 grams. The amount of arseniate obtained was 0·00015 gram. So small a weight is naturally of doubtful and untrustworthy character; but if we, nevertheless, make comparison, 1 kilogram may be considered as yielding 0·00882 gram of arseniate, which corresponds to 0·00459 of arsenious acid.

3. *Brain.*—The entire brain weighed 84·5 grams. This was twice treated with chlorate of potash and hydrochloric acid, in

* For the sake of brevity the word arseniate will hereafter be employed instead of arseniate of magnesium and ammonium.

order to extract the arsenic as thoroughly as possible, the analysis being otherwise effected in the same manner as in the foregoing experiments, from 84.5 grams of brain 0.0005 gram arseniate was obtained, 1000 grams should therefore yield 0.00592, corresponding to 0.00308 gram arsenious acid. In order to ascertain if any arsenic was left in the large quantity of fat which remained after analysis, the same was saponified with solution of caustic soda; the soap thus produced was fused with nitrate and carbonate of soda, the fused mass dissolved in water, the solution boiled with sulphuric acid in such quantities that all nitric acid was expelled; the acid residue being dissolved in water, gave with sulphuretted hydrogen no precipitate of arsenic sulphide.

4. *Liver*.—The weight of the liver was 191.2 grams, from which 0.005 gram arseniate was obtained; 1 kilogram should consequently yield 0.02615 gram, corresponding to 0.01363 gram arsenious acid.

5. *Kidneys*.—The kidneys weighed together 55.8 grams; they yielded 0.0014 gram arseniate; 1 kilogram should consequently give 0.02509 gram, corresponding to 0.01307 gram arsenious acid.

6. *Muscles*.—286 grams of muscles yielded 0.00195 gram arseniate, or 1 kilogram 3.00682, corresponding to 0.00355 gram arsenious acid.

7. *Bones*.—112.5 grams of bone, upon which were only slight remains of muscles, yielded 0.0003 gram of arseniate; 1 kilogram would consequently yield 0.00267 gram, corresponding to 0.00139 gram arsenious acid.

8. *Stomach and Intestines*.—The stomach and the intestines weighed together 350 grams, and yielded 0.0005 gram arseniate; 1 kilogram would thus yield 0.00143 gram, which would correspond to 0.00075 gram arsenious acid.

9. *Heart and Lungs, with a small quantity of Blood*.—These weighed together 237 grams, and yielded 0.0001 gram of arseniate, a weight too small to be trustworthy; but, by approximation, 1 kilogram would yield 0.00042 gram arseniate, equalling 0.00022 gram arsenious acid.

REVIEW OF THE RESULTS.

A. Analysis during Time of Experiment.

26th of February.—The urine, as well as the solid excrements, contained only very slight quantities of arsenic.

28th of February.—1 litre of urine contained 0.002 gram arsenious acid; 1 kilogram solid excrements contained 0.0286.

B. Analyses of Portions of the Dead Body.

1. 1 litre urine contained .	0·02084	gram	Arsenious Acid.
2. 1 kilogram liver contained	0·01363	„	„
3. 1 kilogram kidneys contained	0 01307	„	„
4. 1 kilogram spinal marrow contained . . .	0·00459	„	„
5. 1 kilogram muscles contained	0·00355	„	„
6. 1 kilogram brain contained	0·00308	„	„
7. 1 kilogram bones with remnants of muscles contained	0·00139	„	„
8. 1 kilogram stomach and intestines contained .	0·00075	„	„
9. 1 kilogram heart, lungs, and a little blood contained	0·00022	„	„
	<hr/>		
	0·06112		

Nine kilograms of portions of the body thus yielded 0·06112 gram of arsenious acid. As the dog at time of death weighed only 5525 grams, it is quite evident that the greater portion of the arsenious acid that had been administered to him had been eliminated. No vomiting was perceived.

The observations made at the time of experiment prove that the dog's excretions contained at first only traces of arsenic; the poison having consequently been absorbed by the different organs. It would appear, however, that subsequently efforts were made by his organism to eliminate the poison.

The urine found in the bladder after death contained ten times as much arsenic as that voided on the 28th of February.

The fæces showed a still larger proportion of arsenic than the urine.

The foregoing results agree with the previous observations of several toxicologists, and may serve as a slight supplement to such, as also for confirming the opinions as to the capacity of different organs to absorb arsenic.

Professor TICHBORNE thought this could be hardly called a pharmaceutical paper, but still it might possess a certain amount of interest

to the pharmaceutical chemist having an appointment as analyst. The merit of the paper was that it not only considered the secretion of arsenic in the organism, but the relative amount secreted, and the estimation of its quantity.

Mr. DRAPER said the paper had no bearing on pharmacy, and he was surprised it had been introduced.

Professor ATTFIELD said it seemed to him that the paper was almost wholly chemical. The author, it was true, had made allusion to the different organs of the body, but it was in order that he might tell the Conference what he did with them chemically, and the amount of arsenic he had found in these several organs. A great number of pharmacists were able not only to detect arsenic, but to estimate the amount. They could not all do this, perhaps, but so long as they felt justified in calling themselves chemists as well as druggists, the paper ought to be interesting not only to every member of the Conference, but to every chemist and druggist in the country. As regarded the suggestion made by a member that Dr. Hamberg's final product of ammonio-magnesian arseniate might be contaminated by phosphate, he would remind them that the arsenicum was first thrown out as sulphide from an acid solution, when all phosphates would be left behind.

Mr. REYNOLDS explained that the paper had been put nearly last on the list, and therefore had not excluded anything.

Mr. BOSTOCK, remarking on the action of arsenic on the system, said that arsenic might cause death and yet little afterwards be found by chemical analysis, as the body is constantly throwing off poisons by the kidneys, urine, etc. In the case of arsenic poisoning in a dog, it was found that in the closing part of the dog's life there was more arsenic in the urine, etc. The paper was a very instructive one, and might lead to some very important investigations.

The PRESIDENT said he felt himself perfectly justified in asking for a vote of thanks for the paper, and although he sympathised to some extent with Mr. Draper, yet his impression was perhaps, like his own, produced by the painful details in the first part of the paper; but the latter part was of real scientific value, and the Committee could scarcely be found fault with for introducing it.

Mr. DRAPER apologised to the Committee, and said that without being a sentimentalist, he had felt pained with the first part of the paper, and his ardour as a chemist scarcely counterbalanced the painful feelings with which he had listened to it.

The last paper read was a—

NOTE ON THE ESTIMATION OF MORPHINE IN TURKEY OPIUM.

BY PROFESSOR FLÜCKIGER.

The estimation of morphine is the subject of many valuable papers which have been published in the various pharmaceutical periodicals. Numerous and elaborate as they are, these investigations have not, as far as I can see, arrived at a thoroughly satisfactory result. Without further discussing in this place the merits of these methods, I beg to submit to the Conference another process, of the utmost simplicity, yet of sufficient accuracy. How far this accuracy is attained by the method I now recommend remains for the profession at large to decide. It must be remembered that it is exclusively intended for the assay of official, *i.e.*, Turkey, opium. Valuable as may be the drug produced in other countries with regard to the industrial extraction of alkaloids, no modern pharmacopœia has ever admitted any other kind of opium than that of Asia Minor. My method will possibly prove less satisfactory if applied to Indian or Persian opium, although in my opinion, for a fair standard opium, it is a good and elegant process. It is as follows:—

Take of powdered opium 8 grams (= 123·5 grains), cold water, 80 grams; shake the mixture frequently; filter after twelve hours. The filter should have a diameter of five inches. The operation will afford on an average 65 to 70 grams of clear liquid. No washing is to take place. 42·5 grams of the liquid are collected in a little phial, the weight of which should have been marked on it. Then add to the solution 12 grams of alcohol (sp. gr. 0·812–0·815), 10 grams of ether, and 1·5 gram ammonia water of 0·960 sp. gr. The mixture after shaking will remain clear and allow a colourless layer of ether to make its appearance. The phial is corked and allowed to stay without further shaking it. After an hour or two, crystals of morphine begin to be formed, mostly at the border of the two layers. By-and by they sink down to the bottom, and after a day or two the whole amount of whitish or white crystals of the alkaloid will be deposited. They are then to be collected by using two folded filters having a diameter of four inches. The phial is rinsed out with a mixture of 6 grams of alcohol and 5 grams of ether, and lastly with 10 grams of ether; these liquids being gradually poured on to the crystals in order to wash them.

The funnel in the meantime is carefully covered. The crystals are subsequently cautiously pressed between the folds of the two filters, which will almost completely absorb the mother liquor which the crystals of morphine may still retain. It will now be easy to remove the alkaloid very neatly from the filter; it must be weighed in the very phial in which some crystals may have remained obstinately attached to the walls. The phial, lastly dried at 100° C., then contains the whole amount of morphine precipitated, that is to say its hydrate, viz., $C_{17}H_{19}NO_3 + OH_2$.

As to the mother liquor, it is to be observed for a day more in another corked phial; it does not usually afford a further crop of crystals. Yet in an open vessel amorphous matters are soon deposited.

A good Turkey opium being under examination will thus afford about 0.40 to 0.48 gram of morphine, which are to be considered as deriving from half the weight of the sample, *i.e.* from 4 gram opium; the percentage would then be 10 to 12.

The alkaloid must next be identified by resorting to the usual tests for morphine. Among them there is the official nitrate of bismuth, which I have pointed out some time ago* as one of the most characteristic tests for that alkaloid. If morphine is rubbed with concentrated sulphuric acid, the liquid turns dark brown or black as soon as a little nitrate of bismuth is strewn on it. An excess of nitric acid present in the official nitrate of bismuth would at first produce rather a red hue. Lastly, there is also to be ascertained the purity of the crystals. To this effect take 1 decigram of the morphine, and dissolve it in 10 grams of lime-water. If the lime-water is duly saturated, in the cold, the quantity mentioned will be a little more than sufficient. The morphine will then prove to leave a very trifling amount of colouring matter, quite insufficient to influence appreciably the percentage of the alkaloid. Should narcotine be present it would remain undissolved, and might be weighed if the whole quantity of morphine be treated with lime-water. But it would, in such a case, be much more advisable to get rid of the narcotine by repeating the experiment with another sample of opium. I would recommend then, as I have already urged in the "Pharmacographia," page 59, to dry the opium previously, and to deprive it of narcotine by exhausting it with boiling ether. It must be borne in mind that we have to do now with perfectly dry opium, whereas in the beginning we started with air-

* See my "Pharmaceutical Chemistry," Berlin, 1879, page 373.

dry opium, the latter containing, possibly, as much as 7 or 8 per cent. of water.

If to the solution of morphine in lime-water, a little chlorine water is added, a remarkable reaction is displayed. The mixture assumes a permanent bright red hue, which is highly characteristic; this is, in fact, an excellent new test for morphine.

The assay as just described somewhat minutely is of the utmost practical simplicity. It must be granted that it claims no special rapidity, but it is by no means longer than any other process hitherto devised for the same purpose.

A few explanatory remarks must still be added. As a solvent for opium, cold water is by far the best, for the simple reason that it affords immediately a liquid ready for the precipitation of the alkaloid. It is true that the drug yields a less coloured solution by using alcohol, but this would require a distillation.

If opium is to be exhausted by means of water, it is extremely difficult to point out how far the extraction must be carried on. Cold water on an average dissolves about 60 per cent. of standard Turkey opium, if it is absolutely exhausted. By treating 8 grams of opium with 80 grams of water, we should consequently obtain very nearly 85 grams of solution. As it is practically almost impossible to get really as much as this, it will be safer to use just half the amount of the calculated liquor, namely, 42.5 grams. The analyst who does not feel satisfied with this average number may ascertain exactly the amount of soluble constituents which his sample of the drug is able to yield; he may then act accordingly.

I believe the morphine to be present in the opium as a sulphate, at least for the most part. This is evidenced by the fact that the alcoholic solution of opium is found to contain both the alkaloid and sulphuric acid. In the aqueous solution inorganic sulphates are also present, chiefly sulphate of calcium; but in alcohol of all the sulphates only that of morphine (or other alkaloids) can be in solution. The sulphuric acid met with in the alcoholic solution of opium must therefore be due to sulphates of alkaloids. The solutions of alcohol display a slightly yet undoubtedly acid reaction as the vegetable juices generally do. The acidity of opium becomes more distinctly manifest if its solutions are cautiously concentrated; it is no doubt due to meconic acid.

It is important to precipitate the morphine from a solution containing alcohol and ether. By adding ammonia to an aqueous solution, a flocculent matter is precipitated. This abundant amorphous mass, either an alkaloid or not,—it is certainly far from being

simply morphine,—remains in solution if the liquid contains a little alcohol; one-third alcohol of the volume of the aqueous filtrate is quite sufficient for the purpose. Yet of no less importance is the action of the ether. It not only prevents the narcotine from being thrown down together with the morphine, but ether greatly promotes the formation of distinct and pure crystals of morphine. This alkaloid evidently separates very readily from a liquid saturated with ether.

No further mention is made in the above considerations of narcotine. Should its amount be also estimated in the official drug? I think not. The action assigned to narcotine by the physiological experiments appears to be not considerable at all. Should it, however, become desirable to estimate it, it would probably be a good plan to extract the opium first by water and then by acetic acid. The narcotine is present chiefly in the free state, as it is not really an alkaloid; it is therefore not, or not entirely, removed by water. With acetic acid, as well as with other acids, narcotine forms not well defined salts; the acids are simply solvents, from which it again separates as soon as the acid is neutralized. This is accomplished with carbonate of calcium. By shaking an acetic solution of narcotine and morphine with that carbonate, narcotine is precipitated; not so the morphine. I have not, however, more exactly investigated this method, practical pharmacy, to which the present paper is devoted, being not strictly interested in the matter.

I believe that the above method for the estimation of morphine very well answers for pharmaceutical purposes. I shall be glad if the criticisms which it may meet with lead to some further progress in the question under notice.

Mr. DRAPER passed a warm eulogium on the paper, which he said was characterised by great lucidity.

Mr. NAYLOR said it was not his experience that morphia existed in the form of sulphate of morphia, unless the paper referred to the Turkey opium. If morphia was dialysed, the sulphate of morphia would undergo no decomposition whatever. If it was carefully examined by the microscope, the sulphate of morphia could be readily seen, and so also could the crystals of the meconate of morphia if it was evaporated at a low heat. If meconate of morphia was heated at a high temperature it would split up. His objection to the process was, that no very special provision in the process—as part of the process—was made for separating narcotine. The process to

which they had just listened was identical with the beautiful process of Yvon, published in the *Journal de Pharmacie et de Chimie*, only, if his memory served him correctly, the proportions of spirit and ether were a little different.

Mr. WILLIAMS viewed it as a slow process compared with others.

Professor ATTFIELD admitted that it was a slow process, but easy.

The PRESIDENT said Professor Flückiger deserved their thanks for his paper, and the Conference accorded him that compliment.

CLOSING BUSINESS.

PLACE OF MEETING IN 1880.

Mr. N. M. GROSE (Swansea), introduced by the President, said he was deputed by the pharmacists of Swansea to convey to the British Pharmaceutical Conference a hearty invitation to visit the town in 1880, and if the Association did them the honour to accept the invitation, they would do all in their power to render their sojourn in Swansea agreeable.

Professor ATTFIELD moved that the best thanks of the meeting be accorded to the chemists of Swansea, so ably represented by Mr. Grose, and that their invitation be accepted.

Mr. REYNOLDS seconded the motion, and, adverting to the admirable way in which Sheffield had received the pharmacists, said Yorkshire felt proud of Sheffield for the way in which it had entertained the Conference

The motion was then carried.

ELECTION OF OFFICERS.

A ballot for the President and Officers for the ensuing year was then taken, with the following result:—

President.

W. SOUTHALL, F.L.S., Birmingham.

Vice-Presidents.

N. M. GROSE, Swansea.

R. REYNOLDS, F.C.S., Leeds.

G. W. SANDFORD, Pres. Ph. Soc. of G. B., London.

W. WARD, F.C.S., Sheffield.

Treasurer.

C. EKin, F.C.S., Bath.

General Secretaries.

Professor ATTFIELD, F.C.S., London.

F. BADEN BENDER, F.C.S., Manchester.

Local Secretary.

J. HUGHES, Swansea.

Other Members of Executive Committee.

M. CARTEIGHE, F.C.S., London.

T. GREENISH, F.C.S., London.

H. W. MALEHAM, Sheffield.

A. H. MASON, F.C.S., Liverpool.

C. SYMES, Ph.D., Liverpool.

J. C. THRESH, F.C.S., Buxton.

W. A. TILDEN, D.Sc., F.C.S., Clifton.

C. UMNEY, F.C.S., London.

J. T. WILLIAMS, Swansea.

Auditors.

G. ELLINOR, Sheffield.

J. LLOYD, Swansea.

THANKS TO THE LOCAL COMMITTEE, ETC.

Mr. WILLIAMS moved—

“That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the Local Committee, and the other Sheffield members, and especially to Mr. Maleham, Mr. Ward, Mr. Ellinor, Mr. Learoyd, and Mr. Cubley for the very successful manner in which they had conducted the arrangements of the meeting.”

He said Mr. Reynolds had stated that Yorkshire felt proud of Sheffield for the way in which it had entertained the Conference, and if Sheffield had satisfied Yorkshire, he felt that the rest of the country must be satisfied.

Mr. DRAPER seconded the motion, and referred to their cordial reception and the pains the Local Committee had taken in showing the pharmacists the various manufactories for which the town was famous.

The motion was carried unanimously.

Mr. WARD, in acknowledging the compliment, said it had afforded him extreme pleasure to see the Conference in Sheffield, but he must in justice say that nearly the whole of the work had devolved upon Mr. Maleham. If the Association were gratified, the Local Committee were satisfied, and if they were satisfied the Local Committee were gratified.

Mr. MALEHAM said he was glad to have an opportunity of expressing his gratification at the kind manner in which the services of the Local Committee had been acknowledged by their guests. He deprecated the idea that he had done all the work, and said he had been ably supported by the Local Committee and Mr. Learoyd, the Assistant Secretary.

Mr. LEAROYD and Mr. ELLINOR also acknowledged the compliment on behalf of the Local Committee.

Professor TICHBORNE moved the following resolution :—

“That the members of the British Pharmaceutical Conference, assembled in Sheffield, desire to express their best thanks to Messrs. John Brown & Co., Limited, and Messrs. Brown, Bayley & Dixon, for having thrown open their most interesting works; and also to the managers of departments and others whose courtesy and attention so enhanced the pleasure of the visit.”

Mr. T. F. ABRAHAM seconded the motion, which was carried.

Professor FOSTER moved the following resolution :—

“That the best thanks of the Conference be conveyed to Messrs. John Round & Son, Messrs. Joseph Rodgers & Son, and Messrs. Walker & Hall, who have so kindly afforded members the privilege of visiting their works.”

Mr. WALTER HILLS seconded the motion, which was carried.

THANKS TO THE PRESIDENT.

Mr. SUMNER moved—

“That the best thanks of the Conference be given to the President for the able manner in which he has conducted the business of the meeting.”

He said he was delighted at the ability shown by the young members of the Conference, and that their papers showed that they were making progress beyond their predecessors. He did not see

why such should not be the case, for they should live on the experience of the past and the practice of the present.

Mr. RADLEY, as the senior member of the trade in Sheffield, seconded the resolution, and referred to the efforts of the President in the promotion of pharmacy.

The motion was carried with acclamation.

The PRESIDENT, in acknowledging the compliment, said he was afraid his friends sadly overrated his efforts as President. It must not be forgotten that he followed a long list of distinguished men, from whose example he had had large opportunities for learning his duties; moreover, the kind consideration he had received from every individual who had attended the meeting had rendered his task so easy that his own share of the merit of having presided with some success was very small indeed. He confessed to some feeling of regret at relinquishing his highly honourable post, but had the satisfaction of knowing that it would pass into the hands of a very able man, one whose scientific qualifications would certainly very much exalt its dignity.

THE RESIGNATION OF PROFESSOR ATTFIELD.

The PRESIDENT said although the positive proceedings of the Conference had now concluded, there was just one matter he should like to introduce to their notice. The opinion had been expressed in the Executive Committee at its sitting that afternoon, that the members of the Conference generally would probably wish that some permanent record of their obligation to Professor Attfield should be presented to him, now that he found it necessary to resign the post of Honorary Secretary. The Committee had accordingly prepared resolutions, which would now be submitted for the approval of those present.

- “1. That under the circumstance of Dr. Attfield’s announced retirement from the post he now occupies, it is desirable to institute some permanent recognition of the invaluable services to the Conference rendered by Professor Attfield as its Senior General Honorary Secretary since its establishment sixteen years ago.
- “2. That the gentlemen present form themselves into a Provisional Committee to give effect to this resolution, with power to add to their number.
- “3. That Mr. Carteighe be appointed Honorary Secretary *pro tem.* to the above Committee.”

These resolutions were very cordially received, after which the Conference broke up.

EXCURSION.

On Thursday, August 21st, the day following the meetings of the Conference, the members and visitors attending were escorted by the Local Committee, on behalf of the chemists of Sheffield and district, through some of the charming scenery of Derbyshire on an excursion to Haddon and Chatsworth.

Punctually at nine o'clock a large muster of ladies and gentlemen assembled at the Freemasons' Hall, whence the party drove in "four-in-hands" and open carriages, *via* Owlbar, Calver, and Bakewell, to Haddon Hall. Here, by kind permission of His Grace the Duke of Rutland, luncheon was served in the old banquetting hall. Afterwards the historic and picturesque ruins were inspected, and at about three o'clock the party left for Chatsworth. Throughout the day the wild moorland and rich valleys through which the party drove were freshened by occasional showers. At length the park gates at Chatsworth were reached, and a pleasant drive in the park brought into view the palace itself. Here all alighted, and were conducted through the house and grounds, by permission of His Grace the Duke of Devonshire. Much interest was felt in the splendid sculpture gallery and the galleries of paintings and objects of æsthetic and historic interest in which Chatsworth House abounds. The views of the grounds and distant landscape obtained from the windows were much admired. The grounds were then visited, and great interest was taken in the many successful attempts of art to rival nature. The cascades were next seen, and finally the fountains, which had been playing with fine effect throughout the visit. Leaving the palace, the party walked across the park towards Baslow. At Baslow "High Tea" was served, Mr. Ward, F.C.S., of Sheffield, in the chair. In addition to the usual formal toasts, there were many which drew forth expressions of the universal feeling of gratitude to the Local Committee, and especially to Mr. Maleham, the Local Secretary for the successful manner in which the very excellent arrangements had been executed. The party afterwards drove back to Sheffield.

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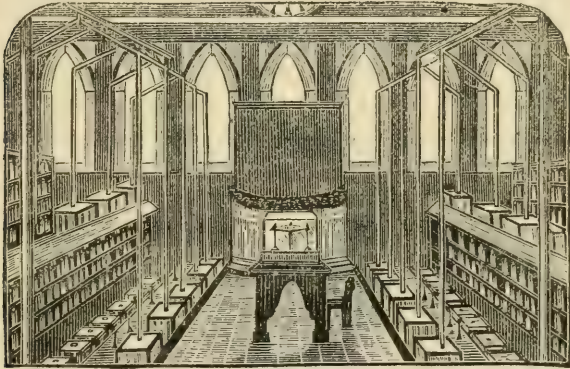
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IMPORTANT CAUTIONS

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VICE-CHANCELLOR SIR W. PAGE WOOD, by whom the suit in Chancery was first heard, stated in his judgment that "Dr. J. Collis Browne was undoubtedly the Inventor of Chlorodyne, that the whole story of the defendant Freeman was as deliberately untrue as the falsehood he had deposed to with reference to the use of his Chlorodyne in the hospital."

THE VICE-CHANCELLOR also stated "that Chlorodyne was a fanciful name, and had application been made sooner, the Court would have given Dr. Browne protection."

LORD CHANCELLOR SELBORNE coincided with the judgment of the Vice-Chancellor upon this point, and stated "that had application been made at a proper time and place, the Court would have found means to restrain the Defendant from misrepresenting the decision of the Vice-Chancellor."

LORD JUSTICE JAMES, on appeal, stated in his judgment, "that the Defendant Freeman had made a deliberate misrepresentation of the decision of Vice-Chancellor Wood."

It was proved in court, on affidavit by Mrs. Forbes, of Paris, that the testimonial published in the "Times," November 14th, 1865, speaking of the great efficacy of Chlorodyne in Cholera, referred to Dr. J. Collis Browne's Chlorodyne, and that she never used any other, that she had written to the Defendant Freeman to that effect; notwithstanding which notice the Defendant publishes the said testimonial as referring to his medicine.

The Editor of the "Medical Times and Gazette," in his report on Chlorodyne, January 13th, 1866, gives information that the Chlorodyne referred to was the medicine introduced by a retired Army Medical Officer, which was Dr. J. Collis Browne. Still this is published by the Defendant as testimony to his medicine.

Numerous affidavits from eminent Physicians and others were produced in Court, stating that Dr. J. Collis Browne was the inventor of Chlorodyne, and that when prescribing they mean no other.

The Defendant himself publishes that his compound is in effect and composition quite different to any other preparation; nevertheless he assumes the name, testimonials, etc., of Chlorodyne.

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A good sound wine, combining body and strength, and specially adapted for medicated wines and other purposes. Packages to be paid for, and allowed upon return.

E. BOWERBANK & SONS, THE BISHOPSGATE DISTILLERY, SUN STREET, LONDON.

ORANGE WINE, Finest Quality;

Guaranteed not to cause a deposit or become opaque by the addition of quinine. 6s. per gallon, net cash. Second Quality, 5s. net.

BOWERBANK'S
CELEBRATED PURE SPIRITS OF WINE

Is used by all the principal Wholesale Druggists, Pharmacutists, and Perfumers in town and country. It is allowed to be the best article for making Tinctures, Essences, and the most delicate Perfumes, being perfectly free from smell and fusil oil. Can be obtained through Druggists, with E. B. & Sons' name and label on bottles, etc.

ESTABLISHED 1782.

The BISHOPSGATE DISTILLERY, Sun Street, London.

Also at DUNNING'S ALLEY, and 1, LAMB ALLEY.

N.B.—No connection with the House styled Bishopsgate Distillery and Wine Company.

CHEQUES—LONDON AND WESTMINSTER BANK.

HAY'S SOLUBLE ESSENCE OF JAMAICA GINGER.

(Guaranteed Pure and Free from Capsicum.)

This highly concentrated Essence has the purest Jamaica Ginger flavour and aroma, is highly adapted for the manufacture of Aërated Waters, and for all dietetic, medicinal, and pharmaceutical purposes.



Trade Price,
5s. per lb.

THE COMPOUND ESSENCE

(GUARANTEED PURE AND FREE FROM CAPSICUM).

This Essence, which is an addition of *Vanilla*, *Lemon*, and *other flavours* to the above, is strongly recommended for the manufacture of Ginger Beer, Wines, etc., to which it imparts with the GINGER a PECULIARLY FINE FRUITY FLAVOUR and AROMA.

Trade Price, 5s. 6d. per lb.

MEDICAL AND OTHER OPINIONS ON THE SOLUBLE ESSENCE.

"Singulantly free from resin."—*The Lancet*, London, July 13th, 1878.

"It is a pure, elegant preparation, and is free from resinous matter. Ginger Beer made with it is clear and transparent, has the aroma and flavour of the Ginger, and is very pleasing to the palate."—*Medical Times and Gazette*, London, March 16th, 1878.

"It should entirely supersede the official preparation of the *British Pharmacopœia*. The Ginger Beer made with this pure TINCTURE OF GINGER is extremely grateful and palatable. It is clear and bright as water; in fact, it will be scarcely recognised under the old name, and is CERTAINLY PREFERABLE TO SOME WINES we have tasted under the name of CHAMPAGNE."—*Medical Press*, London, March 20th, 1878.

"It is a Pharmaceutical Desideratum. Ginger Beer manufactured from this ESSENCE has the purest Jamaica Ginger Aroma, distinguishable as soon as poured out. It is a beverage fit for any gentlemen's table, and ought to attain great popularity."—*The Chemist and Druggist*, London, November 15th, 1877.

PREPARED BY

W. HAY, Manufacturing Chemist,
4, REGENT'S TERRACE, ANLABY RD., HULL.

GOLD MEDAL, PARIS EXHIBITION, 1878,
HAS BEEN AWARDED TO

T. & H. SMITH & CO.,
EDINBURGH, & 12, WORSHIP STREET, LONDON,

MANUFACTURERS OF

SALTS OF MORPHIA, PURE CHLOROFORM,
SALICINE, Etc.

PRECIPITATED SULPHUR, B. P.

Soft, Pure, and Superior Colour,

MANUFACTURED BY

DUNN & COMPANY,
MANUFACTURING CHEMISTS,
STIRLING CHEMICAL WORKS, WEST HAM,
Late of 10, Princes Square, Finsbury, London.

OIL OF EUCALYPTUS.

DISTILLED FROM THE LEAVES OF THE

Amygdalina Odorata of Australia.

Valuable as a Perfume, a base for mixed Oils, a solvent for Gums and Resins, and a Medicinal Agency of proved efficacy. It is largely used in the Melbourne Hospitals, internally as a stimulant, carminative, and anti-spasmodic; and externally for Rheumatism, etc.

SOLE AGENTS FOR ENGLAND:—

GRIMWADE, RIDLEY & CO., Mildmay Chambers,
82, BISHOPSGATE STREET, E.C.

SPIRITUS RECTIFICATUS, P. B.
CHEMICALLY PURE
RECTIFIED SPIRITS OF WINE.

A highly rectified ENGLISH GRAIN SPIRIT, free from fusel oil.

60 over proof, 20/10 per gallon; 56 over proof, 20/4 per gallon; less 6d. per gallon for five gallons. Lower quotations for quantities. Cash on delivery or with order. Packages charged, and money repaid when empties returned, 2s. 6d. for two gallons; 5s. for five gallons. Country orders must contain remittance or reference to London Drug House.

JAMES BURROUGH & COMPY.,
CALE STREET DISTILLERY, LONDON, S.W.

Also duty free for exportation.

HUBBUCK'S PURE OXIDE OF ZINC.

PHARMACEUTICAL CHEMISTS will use this in preference to the ZINCI OXIDUM of the Br. Ph. 1867, which is a roasted Carbonate, forming an impure Hydrate instead of a pure Oxide.

HUBBUCK'S PURE OXIDE is made by sublimation, and is warranted to contain 99·5 per cent of Pure Oxide.

*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON,
Wednesday, April 2nd, 1856.

"On Pure Oxide of Zinc for Use in Medicine."

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide had been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

"The specimen of oxide of zinc on the table was not only free from all impurities, but it possessed the other qualities required. It was a perfectly white, light, and smooth powder.

"Mr. HUBBUCK stated that the oxide of zinc which his firm made for use in medicine was free from impurities commonly occurring in the oxide made by combustion. The zinc was first thoroughly refined, and all the lead, arsenic, cadmium, iron, and other impurities removed. The pure oxide was then produced by combustion, abstracting only the very finest part of the product for medicinal purposes. About one-tenth or one-twelfth of the whole was thus set apart in producing that from which the sample exhibited had been taken; and this could be done, since their usual operations requiring them to make several tons of oxide every day, they could separate as much as was required in a state of absolute purity, while the remainder would be equally valuable as a pigment.

"The CHAIRMAN thought the mechanical condition of substances used in medicine was often a matter of considerable importance, and ought to be considered as well as their chemical composition. He thought the specimen before the meeting was a very perfect one in every respect, and he had no doubt it was the sort of oxide of zinc best adapted for use in medicine."

*To be had of all Wholesale Druggists, in boxes of 7 lbs. and 14 lbs.
each, Stamped by the Manufacturers.*

The Manufacturers supply, Wholesale only, in quantities of not less than a Quarter of a Ton.

HUBBUCK & SON, 24, LIME STREET, LONDON.

WYLEYS & Co.,
Wholesale and Export Druggists and Drug Grinders,
MANUFACTURERS OF
PHARMACEUTICAL PREPARATIONS OF EVERY DESCRIPTION.

Warehouses and Drug Mills: COVENTRY.
London Office: 223, UPPER THAMES STREET.

The attention of the Trade is specially called to undermentioned Specialities :—
Ol. Morrhuæ c. Calcis Hypophosph.; **Ol. Morrhuæ Phosphoratum**; **Ol. Morrhuæ Phosphoratum c. Quiniâ et Strychniâ**; **Ext. Filicis Maris**; **Pepsine**.

CHINOQUININE.

The entire precipitated and bleached crystallizable alkaloids of East Indian Red Bark (*Cinchona succirubra*), containing Quinine, Cinchonidine, and Cinchonine in the form of *Muriates*. In appearance, medicinal properties, and mode of administration it closely resembles Quinine; it may be given in all cases where the pure alkaloid is required, whilst, as a tonic, and in cases where Quinine alone is objectionable, its use is especially advantageous.

In 1 oz. bottles, price 5s. 3d.; 4 oz., bottles, 5s. per oz.; and in 25 oz. tins, 4s. 9d. per oz.

FERRI ET CHINOQUINÆ CITRAS.

A "Scale preparation," containing 25 per cent. of Citrate of Chinoquinine. Dose and medicinal properties the same as Ferri et Quinæ Cit., P.B. In 1 oz. bottles, price 2s. 9d.; or in bulk, 40s. per lb.

LIQUOR FERRI ET CHINOQUINÆ CITRAS.

An elegant preparation of the above in a liquid and very palatable form; prepared for convenience in Dispensing. Each fluid drachm contains 10 grains of Citrate of Iron and Chinoquinine. Price 6s. per lb.

Coated Pills prepared according to any Formula.

Export orders carefully packed and shipped to any part of the world. Price Lists in English or Spanish forwarded on receipt of Business Card.

OL. LAVAND. RECT.

A Product of our Special Process, of Superior Quality. It is now largely used as a substitute for the Mitchem Oil.

TWENTY-ONE SHILLINGS PER POUND.

Through Wholesale Houses, or direct from

SYMES & CO., Liverpool,
MANUFACTURERS OF LAC BISMUTHI, Etc.

FREEMAN'S SWEET ESSENCE OF SENNA.
SYRUP. SENNÆ CONCENT., FREEMAN.

Dr. J. POWER, of Abingdon Street, says—"I am happy in again bearing testimony to the value of your excellent Sweet Essence of Senna, with respect to which my experience has assured me of its absence of griping and nauseating properties; its pure and unadulterated preparation, containing within a comparatively small bulk the whole of the essential principle of that valuable medicine, together with the fact of its being so efficacious as, in my opinion, to supersede, in a majority of cases, the use of those violent and drastic purgatives, Calomel, Aloe, and Jalap. These qualities, combined with the additional advantage of its very agreeable taste, render it a most valuable Aperient, calculated not only for general domestic purposes, but which is more particularly adapted for the lying-in room and the nursery, inasmuch as it may be administered to children of the tenderest age with pleasure and great advantage."

Two drams of this preparation, with the usual proportion of Magnes. Sulph., will form, with the addition of water only, an elegant and efficient extemporaneous Black Draught.

May be obtained through any Wholesale House, in $\frac{1}{2}$ -lb., 1-lb., and 2-lb. Bottles for dispensing, and in the usual sizes for Retail.

Sole Manufacturer: F. TIBBS, Pharmacist, 63, Chalk Farm Road, London, N.W.

BENGER'S PREPARATIONS

OF THE

Natural Digestive Ferments,

Prepared at the Suggestion of Dr. Wm. Roberts, F.R.S.

These solutions contain, in an exceedingly active condition, the digestive principles of the stomach and pancreas respectively.

LIQUOR PEPTICUS (Benger).

This is a digestive solution of great activity. It is prescribed in teaspoonful doses (with or without ten minims of dilute hydrochloric acid) in half a wineglass of water, to be taken with or immediately after meals, especially those meals which include meat or eggs.

LIQUOR PANCREATICUS (Benger).

This contains all the active principles of the Pancreas, and has the power of acting on the three great classes of alimentary substances—being capable of digesting the amylaceous, the albuminous, and the fatty elements of food.

It is used for the peptonization of food previous to administration, as well as medicinally. Dr. Roberts' directions for use accompany each bottle.

These preparations may be obtained in 4, 8, and 16 ounce Bottles, of the Makers, or at the leading Dispensing Establishments.

PREPARED BY

MOTTERSHEAD & CO. (S. Paine & F. B. Benger,)

Pharmaceutical Chymists, 7, Exchange Street, Manchester.

JAMES WOOLLEY, SONS & CO., DRUG GRINDERS

WHOLESALE & EXPORT DRUGGISTS,

AND

Manufacturing Pharmaceutical Chemists,

WAREHOUSE AND
OFFICES:

2, Swan Court,
Market Street,



LABORATORY AND
DRUG MILLS:

Knowsley Street,
Cheetham,

MANCHESTER.

Drugs, Powders, Preparations of the British, United States, and Continental Pharmacopœias, Chemical Products, Chemical and Pharmaceutical Apparatus.

PRICED LISTS AND CATALOGUES ON APPLICATION.



THE SANITARY FLUID



(NON-POISONOUS),

ANTISEPTIC DISINFECTANT for Preventing Epidemics and Destroying Infectious Diseases, as supplied to the Royal Arsenal, Woolwich. This Fluid is a powerful Antiseptic, Disinfectant, and Deodoriser, and from its harmlessness may be applied in any direction without any ill effects, and with the best possible results. THE "PRINCESS ALICE" CALAMITY.—The Sanitary Fluid was used at the Woolwich Dockyard for Disinfecting over 600 Bodies. The Clothing taken from the Bodies and over 500 Sheets were also Disinfected in large Cauldrons; also the Building, Yards, etc., giving the greatest satisfaction to the Dockyard and Parish Authorities. The work was carried out under the superintendence of Mr. HARMER.

TESTIMONIAL.—"H.M. Dockyard, Woolwich, September 23, 1878. SIR,—I beg to inform you that I consider your Disinfectant, as applied in the Dockyard, both to buildings and clothing after the removal of the dead from the premises, very efficacious, and, from its cleanliness and absence of smell, very superior to the Disinfectants in the form of powder generally used.—Faithfully yours, J. T. BARRINGTON, Assistant Commissary-General. Mr. Harmer, Stratford, E."

The Analyst, May, 1879, edited by Dr W. G. WIGNER, F.C.S., and Dr. J. MUTER, M.A., F.C.S., Public Analysts, says of the Sanitary Fluid:—"Two experiments on samples of urine gave satisfactory results, as putrifaction was retarded for several days longer than in similar samples treated with carbolic solution."

For Asylums, Schools, Sanitary Authorities, Railway and Dock Companies, Workhouses, Shipping, Stables, Cowhouses, Cattle in transport, etc. Price 1s. per bottle; 3s. 6d. per gallon; large quantities at a cheaper rate, of the Sole Manufacturer, W. J. HARMER, Chemical Compound Manufacturer, West Ham Lane, Stratford, E., or through Agents.

The MAGIC FLUID, for General Household Purposes, price 1s. 6d. per gallon. Write for Pamphlet, with Testimonials, etc.

PRICE LIST OF FRED LEWIS'S ELECTRIC OIL.

1/6 size	12/-	per doz.	} A liberal discount to Shippers and the Trade.
2/6	"	...	...	...	18/-	"
3/6	"	...	...	...	24/-	"

Handsome Show Cards.

FRED LEWIS & CO., 6, FLEET STREET, DUBLIN.



B. ROBINSON,
Manufacturing Chemist and Distiller,
BREWER OF BRITISH WINES,
PENDLETON, MANCHESTER,
Proprietor of the Concentrated Waters, Corn Solvent, Corn
and Wart Pencil, Toothache Syringe, Empress of India's
Bouquet, etc., etc.

N.B.—Price List of Specialities on application.

VINAIGRE DE BORDEAUX. W. & S. KENT & SONS,

Importers for forty years of finest French Wine Vinegar, old and well matured,
offer it in hogsheads and tierçons. Terms and Samples on application.

UPTON-ON-SEVERN.

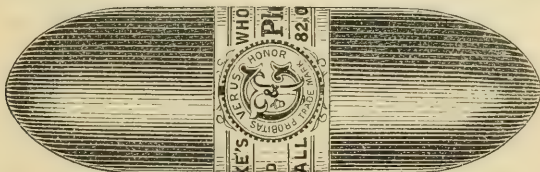
N.B.—PURE FLAVOURLESS SP. VINI

Drugs, Chemicals, & Pharmaceutical Preparations.

GABRIEL & TROKE,
WHOLESALE AND EXPORT DRUGGISTS,
And Manufacturing Chemists,
82, CITY ROAD, LONDON.

Fluid Extracts, Concentrated Infusions, Decoctions, Tinctures,
and all Pharmaceutical Preparations, Sundries, etc.

GABRIEL & TROKE'S
REGISTERED CAPSULED HORSE BALLS,



Manufactured solely by GABRIEL & TROKE,
MANUFACTURERS OF ALL VETERINARY PREPARATIONS. EVERY KIND OF
VETERINARY INSTRUMENTS AND SUNDRIES.

The superior advantages of these Balls are obvious. The mass is confined in an hermetically sealed gelatinous Capsule, perfectly harmless, and immediately dissolved in the stomach. The Capsule will not only prevent the Ball from getting dry and hard, but will preserve its purity and power for any reasonable time, and ensure the effectiveness of the Medicine, especially when such drugs as Camphor, Ammonia, or Essential Oils are prescribed. These Capsuled Balls are most convenient and safe, and well adapted for export, keeping good in any climate. They are put up in boxes of one dozen each. Capsuled Balls of the most approved Formulæ on hand, and *private* recipes faithfully and accurately dispensed.

Shipping Orders promptly and carefully executed and at lowest market prices. Price Lists of a very extensive character, in the most handy, referable style. Samples and special quotations on application.

WHELPTON'S VEGETABLE PURIFYING PILLS



Are one of those rare Medicines which, for their extraordinary properties, have gained an almost universal reputation. Numbers are constantly bearing testimony to their great value in disorders of the Head, Chest, Bowels, Liver, and Kidneys; also in Rheumatism, as may be seen from the Testimonials published from time to time. By the timely use of such a remedy many of the seriously afflicting disorders, which result from proper means being neglected, might be avoided and much suffering saved, for "Prevention is better than cure."

Sold in Boxes, price 7½d., 1s. 1½d., and 2s. 9d., by G. WHELPTON & SON, 3, CRANE COURT, FLEET STREET, LONDON, and all Chemists and Medicine Vendors at home and abroad. Sent free by post in the United Kingdom for 8, 14, or 33 stamps.


HOMŒOPATHIC MEDICINES.

E. GOULD & SON,

CHEMISTS BY APPOINTMENT TO THE LONDON
HOMŒOPATHIC HOSPITAL,

Manufacturing Homœopathic Chemists,

WHOLESALE AND RETAIL.

 *Illustrated Prospectus and Trade List forwarded post free.*

Agents' Show Cases, from £2 10s. to £20.

59, MOORGATE STREET, E.C., AND 20, BISHOP'S ROAD, W.

MATTHEWS'S WAXED PAPERS,

For covering Cold Cream, Ointments, Plaisters, etc.,
wrapping Jujubes, Scented Soaps, Violet Powder,
Linseed Meal, Horse Balls, and other greasy, per-
fumed, or adhesive substances, without any of the
objectionable results of using tin foil, and

AT HALF THE COST.

	Per box of 60 Sq. Ft.	Per Ream.
White	2s. 0d.	30s. 0d.
Various tints	2s. 6d.	32s. 6d.
Pink	2s. 6d.	36s. 0d.
Blue	2s. 6d.	32s. 6d.
Green	2s. 6d.	32s. 6d.
Yellow	2s. 6d.	32s. 6d.
Golden	2s. 6d.	34s. 0d.
Black	3s. 0d.	40s. 0d.

PREPARED BY

ROUSE & Co., 12, Wigmore Street, London.

And Sold by all Dealers in Sundries.

WHINCUP'S EXTRACT OF MALT, AND IN COMBINATION WITH COD LIVER OIL.

Bottles, 1/9. At all Medicine Warehouses, or of the Manufacturer, W. WHINCUP,
404, Essex Road, Islington, London, N.

TURNER'S "BLACK CURRANT" COUGH LINCTUS, an unfailing remedy for all kinds
of Coughs, Colds, and Bronchial Affections. 1s. 1½d. and 2s. 9d. per bottle.

TURNER'S RHEUMATIC POWDERS give immediate relief. 7½d. and 1s. 1½d. Packets,
with directions.

TURNER'S "DR. CONNELL'S TONIC DROPS," a fine Strengtheners and Nerve Tonic.
1s. 1½d. and 2s. 9d. per bottle, with directions.

PREPARED SOLELY BY

J. TURNER, Pharmaceutical Chemist, Aylesbury,

And Protected by his registered "Trade Mark."

COBDEN'S

QUININE AND PHOSPHORUS PILLS,

2s. 9d. and 4s. 6d.

THE NEW NERVE TONIC.

The Rev. John Sheward, of Milton, Sittingbourne, Kent, writes, Oct. 29th, 1878:—"I have been a sufferer for many months from extreme diarrhoea, great weakness, and severe mental depression: my nerves were so shattered that I dreaded the simplest duties, and lost all energy and pleasure in the performance of them. The despondency I endured became almost unbearable. I tried so many things without avail, that I began to fear my complaint would refuse to yield to any treatment. I saw COBDEN'S QUININE AND PHOSPHORUS PILLS advertised, but my little faith prevented me sending for them until the 7th instant, when I determined to try a 2s. 9d. box. The only thing that I now regret is that I did not send for them sooner. I have been taking them just over a fortnight, and the change in my health for the better is very marked. I have lost that horrible depression, my nerves are much stronger, and my general health very greatly improved. I cannot express how truly thankful I feel for the remarkable and pleasing change. I shall continue to take the Pills, and always resort to them on the first intimation of failing health."

Mr. Martin, Chemist, Horsham, writes—"Please send another supply of 'Cobden's Quinine and Phosphorus Pills' as before, and if you feel inclined to use my name, do so, as I can safely say your Pills sell as well as the older Patent Medicines that have been advertised for years at a very great cost."

LONDON AGENTS:

*Maw, Sanger, Barclay, Tidman, Hovenden, Mather, Lynch,
Thompson, Millard, Edwards, Sutton, Butler & Crispe, etc., etc.*

The Names of Chemists ordering One Dozen, direct or through
any Wholesale House, will be Advertised as Agents
in their Local Newspapers.

SUSSEX DRUG COMPANY,
135, QUEEN'S ROAD, BRIGHTON,

DYES FOR THE MILLION!

CRAWSHAW'S CRYSTAL DYES.

Beautiful Colours—Easy to use—Economical in Price—Will go six times as far as the ordinary Liquid Dyes—One Sixpenny Box will dye a Lady's Dress.

- 6 D. BOXES CRAWSHAW'S CRYSTAL DYES**, in $\frac{1}{2}$ -gross (7 dozen) Counter Cases, with glass lid, 48s. per gross.
- 6 D. BOXES CRAWSHAW'S CRYSTAL DYES**, in Boxes of 1 dozen (14), 48s. per gross.
- 3 D. PACKETS CRAWSHAW'S USEFUL DYES**, in $\frac{1}{2}$ -gross Boxes, 21s. per gross.
- 3 D. PACKETS CRAWSHAW'S USEFUL DYES**, on Cards of $\frac{1}{2}$ -gross, 21s. per gross.
- 2 D. PACKETS CRAWSHAW'S USEFUL DYES**, in $\frac{1}{2}$ -gross Boxes, 14s. per gross.
- 2 D. PACKETS CRAWSHAW'S USEFUL DYES**, on Cards of $\frac{1}{2}$ -gross, 14s. per gross.
- 1 D. PACKETS CRAWSHAW'S USEFUL DYES**, in $\frac{1}{2}$ -gross Boxes, 7s. per gross.
- 1 D. PACKETS CRAWSHAW'S USEFUL DYES**, on Cards of $\frac{1}{2}$ -gross, 7s. per gross.

EMERALDINE, a New Colour for Chemists' Show Bottles, which gives, with transmitted light, a beautiful Golden Colour, showing a splendid Green fluorescence, 2s. 6d. per bottle.

USUAL TERMS. TO BE HAD FROM ALL THE WHOLESALE HOUSES.

SOLE MANUFACTURERS,

E. CRAWSHAW & CO., 80, Fann St., Aldersgate St., London, E.C.

Chemical Food, or Parrish's Syrup.

* * Each teaspoonful contains 2 grains of Phosphate of Iron and Lime, with smaller proportions of the Alkaline Phosphates, all in perfect solution. One or two teaspoonfuls at mealtime.

Syrup of Biphosphate of Iron and Manganese.

Syrup of Biphosphate of Iron.

Syrup of Biphosphate of Lime.

Syrup of Biphosphate of Zinc.

Syrup of Hypophosphite of Iron, Quinine, and Strychnine.

Syrup of the Superphosphate of Iron, Quinine, and Strychnine.

Syrup of Hypophosphite of Iron.

Syrup of Hypophosphite of Lime.

Syrup of Hypophosphite of Soda.

Compound Syrup of Hypophosphite of Iron and Lime.

Syrup of Pyrophosphate of Iron.

Syrup of Bromide of Iron.

Syrup of Iodide of Quinine.

Syrup of Iodide of Iron and Quinine.

Syrup of Peracetate of Iron and Quinine.

Solution of Peracetate of Iron.

Do. Glacial.

Clinical experience has proved that this preparation contains Iron in the most assimilable form.

Solution of Peracetate of Iron and Quinine.

COD LIVER OLEIN.

This preparation, is prepared from the finest Newfoundland Oil, containing all the active principles, without its impurities, and will be found to agree with the most delicate stomachs.

Phosphorised Cod Liver Olein.

Cod Liver Oil with Quinine.

Cod Liver Oil with Iodide of Iron.

Cod Liver Oil with Bromide of Iron.

SYRUP OF HYPOPHOSPHITE OF IRON AND QUININE.

This preparation has been successfully given in Hysteria, Epilepsy, spermatorrhoea, and other exhaustive derangements of the Nervous System.

DIALYSED IRON.—Dose, 10 to 30 minims in water.

Proprietors of the City of London Cough Lozenges and Pills, Toothache Annihilator and Antiseptic Saline.

BREWER & MARSTON, Pharmaceutical and Operative Chemists,

105, (LATE 99), LONDON WALL, E.C.

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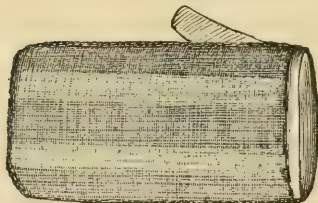
DINNEFORD & CO. (The Original Patentees)

Beg to announce that they have resumed the Manufacture, on their own premises and with Improved Machinery, of

Horse-Hair Friction Gloves, Belts, Bath Brushes, Oxford and Cambridge Pads, &c., &c.

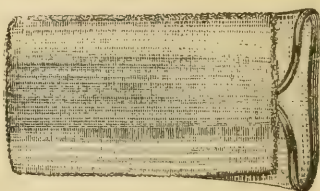
In white, grey, and black hair, of various degrees of hardness, to suit the most delicate, without risk of injury to the skin.

WHOLESALE PRICE LIST.



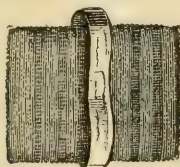
LADY'S AND GENT'S FLESH GLOVE (in Paris).

No. 1 size, 36s.; No. 2, 40s.; No. 3, 42s.
per doz. pairs. Retail, 5s.



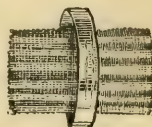
PRINCE OF WALES BATH GLOVE.

For wet or dry use. 21s. per doz. Retail, 2s. 6d. each.



CLARENDON FLESH RUBBER.

Hair on both sides. One surface is soft, the other hard; either may be used for friction.
24s. per doz. Retail, 3s. 6d. each.



ARMY BATH PAD.

For wet or dry use. Hair on both sides.
A luxury for the Bath. 12s. per doz.
Retail, 2s. each.

OXFORD WASHING PAD.

For cleaning and softening the hands, and for the bath. In 1 doz. boxes; 8s. per doz.
Retail, 1s. each.

ALEXANDRA BATH BRUSH.

Hair on both sides, on a long handle. 24s. per doz. Retail, 2s. 6d. each.



CAMBRIDGE PAD.

Hair on both sides; for softening the hands and for the bath, 12s. per doz. Retail, 1s. 6d. each.

THE DEMIDOFF.

42s. per doz. Retail, 5s. each.



FLESH STRAP OR BELT, AND BATH STRAP.

LADIES' quality, light hair and soft pile. GENTS' quality, black or grey, and pile of various degree of hardness. 42s. per doz. Retail, 5s. each.

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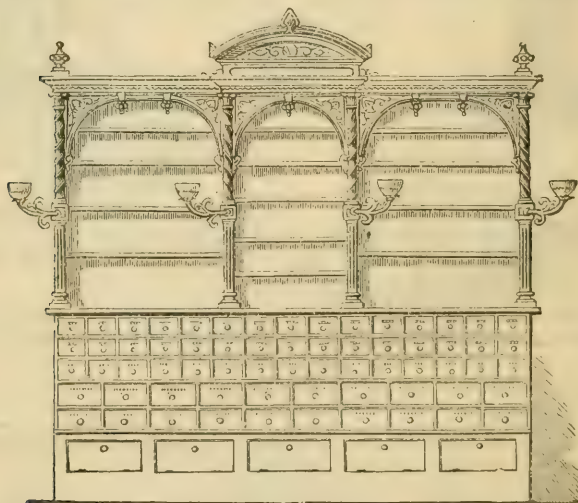
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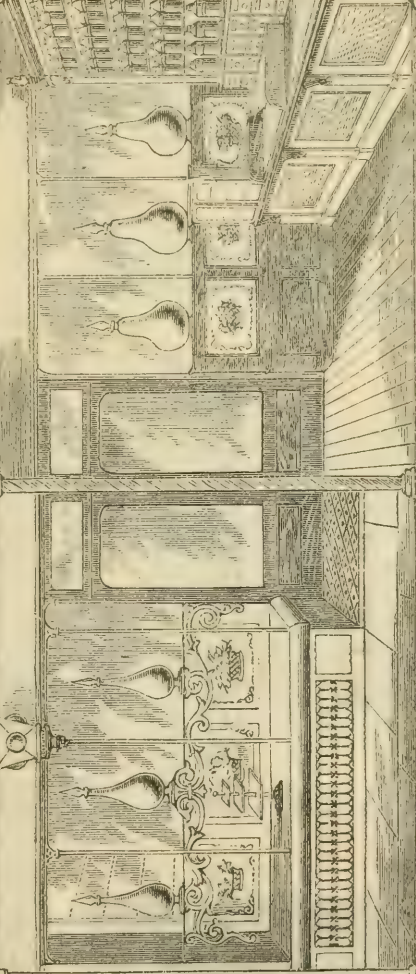
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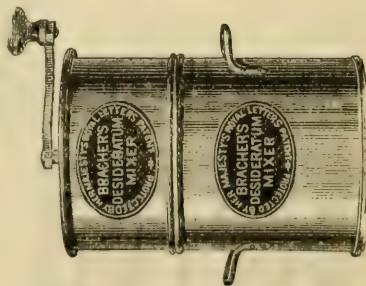
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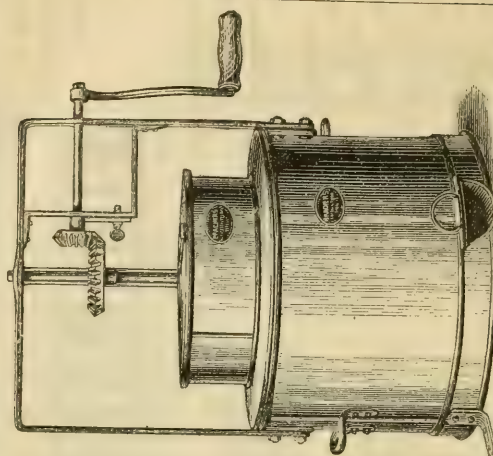
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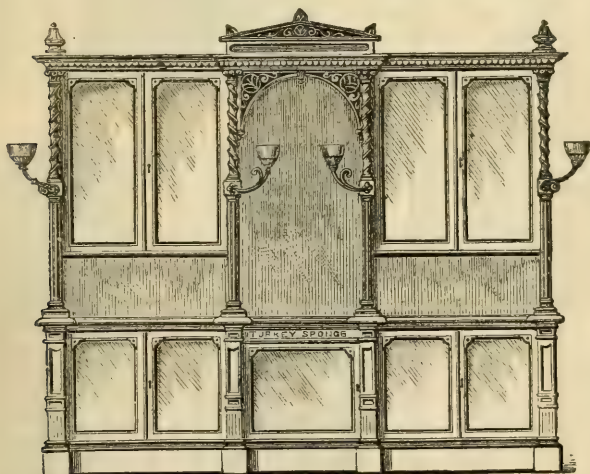
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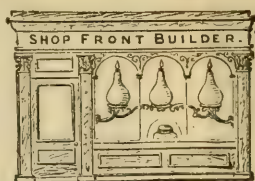
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Size.	Height.	N.M.	W.M.	N.M.	W.M.			Size.	Height.	N.M.	W.M.	N.M.	W.M.		
20 oz.	9 in.	16/-	18/-	19/-	21/-	per doz.		42 oz.	11 in.	20/-	24/-	24/-	27/-	per doz.	
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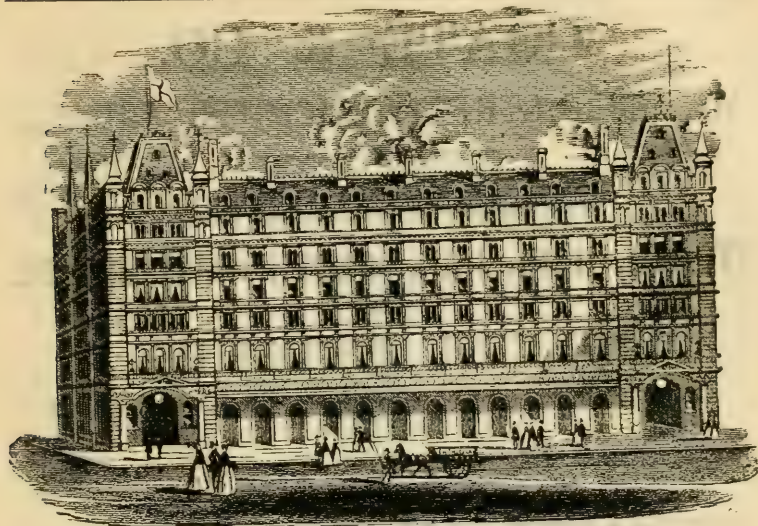
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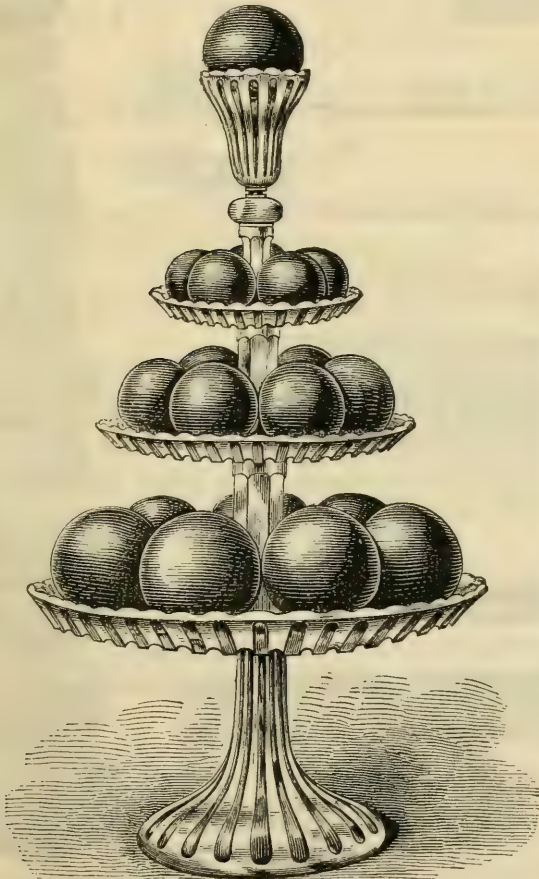
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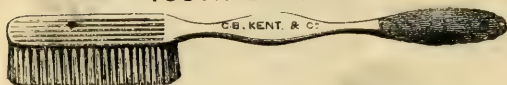
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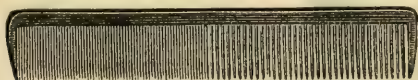
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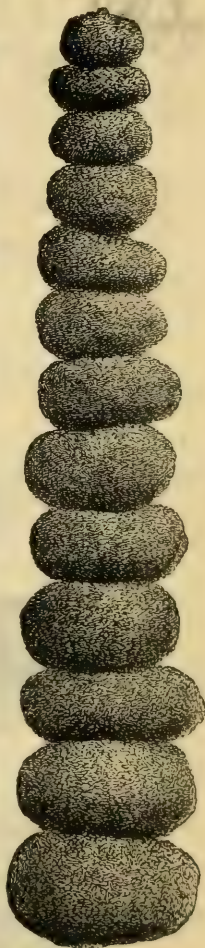
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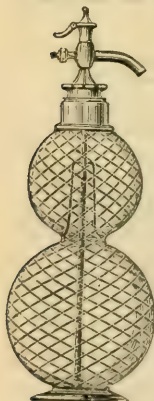
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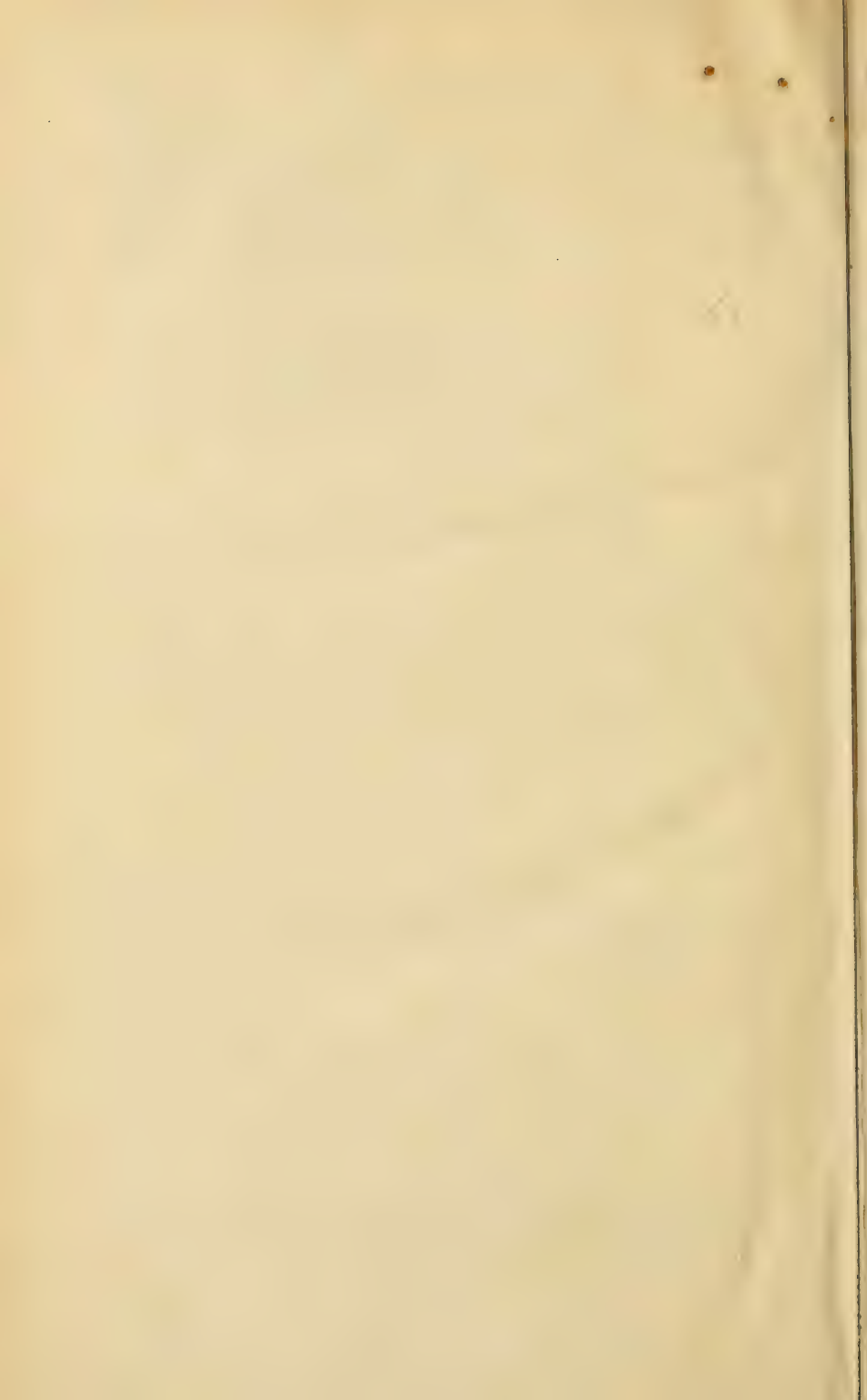
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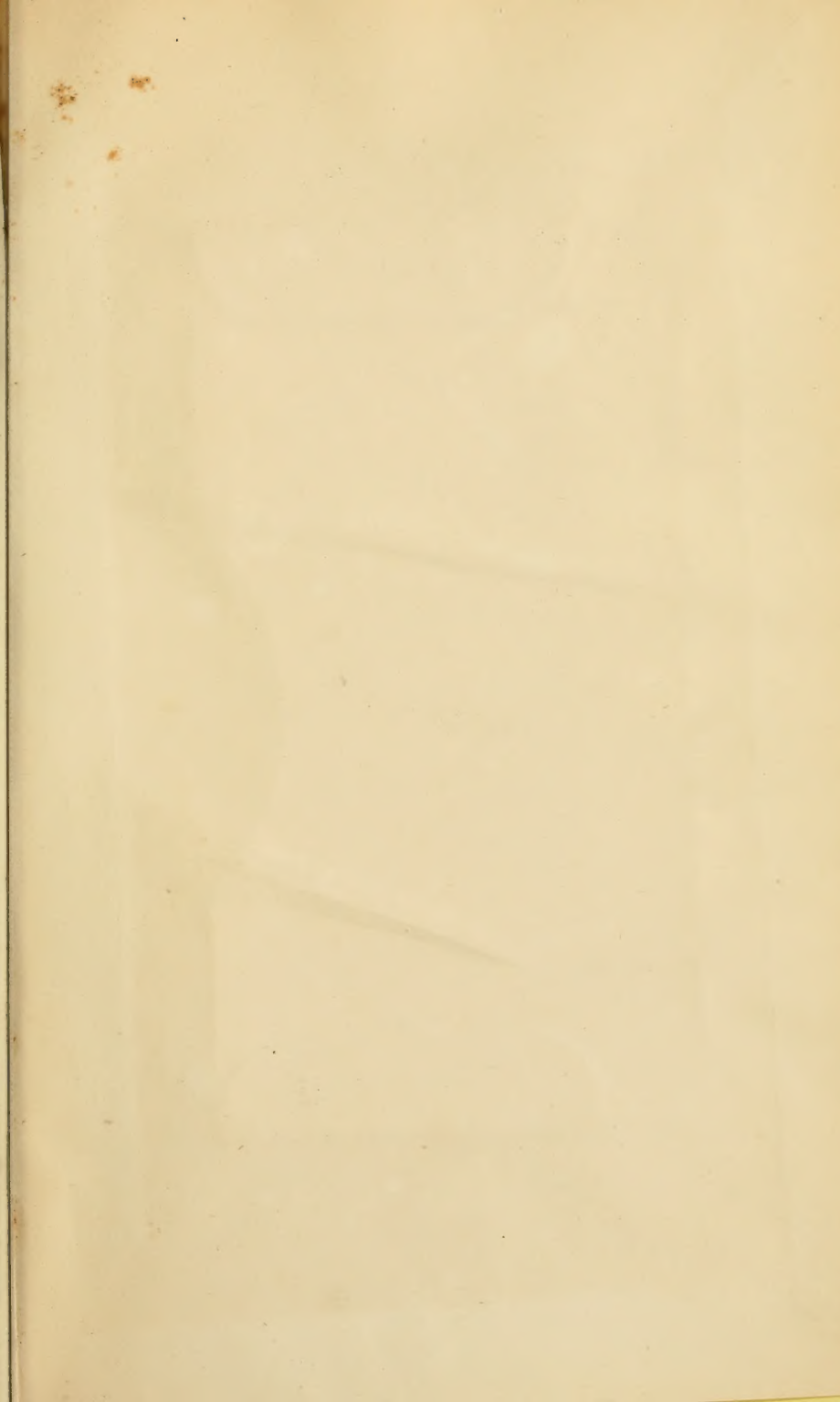
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